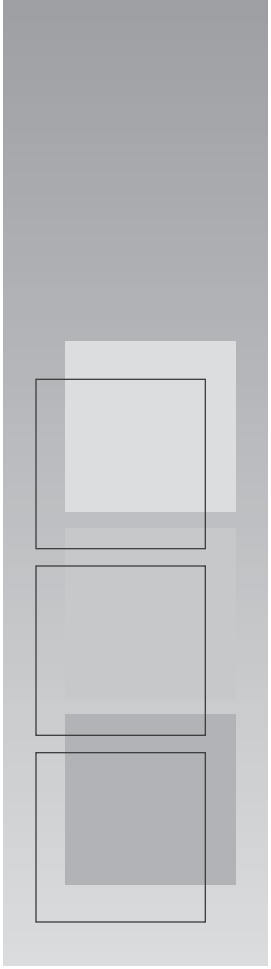
Burden of **ASTHMA** in Wisconsin 2004



Burden of **ASTHMA** in Wisconsin 2004

Wisconsin Department of Health and Family Services
Division of Public Health, Bureau of Environmental Health, P.O. Box 2659, Madison, WI 53701-2659
http://dhfs.wisconsin.gov

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From the Secretary of the Wisconsin Department of Health and Family Services

Asthma is a significant public health problem resulting in considerable personal and economic costs. The Wisconsin Department of Health and Family Services is committed to improving the quality of life and reducing the burden of illness among Wisconsin residents with asthma, their families and their communities. As part of this effort, the Department has been conducting asthma surveillance to understand the impact of asthma in Wisconsin. Surveillance activities allow us to track rates of asthma, the distribution of asthma in the population, patterns of asthma management and health care utilization, costs associated with asthma, as well as the impact of asthma-related interventions. This report, The Burden of Asthma in Wisconsin, provides insight into all of these critical areas.

The Burden of Asthma in Wisconsin is the first comprehensive asthma surveillance report issued by the Department of Health and Family Services. It required the efforts of key stakeholders working together to describe the current state of the burden of asthma in Wisconsin. This report represents the culmination of several years of effort and will serve as the foundation for future asthma surveillance activities in Wisconsin.

The information contained within this report can serve to guide individuals and organizations in Wisconsin working to improve the lives of people with asthma. This report will be updated periodically to allow assessment of efforts, to guide further planning and intervention activities, and to incorporate new data as they become available. Together with the State Health Plan, *Healthiest Wisconsin 2010* and the *Wisconsin Asthma Plan*, released by the Wisconsin Asthma Coalition in October 2003, *The Burden of Asthma in Wisconsin* will serve as a guide as we work towards reducing the burden of asthma in Wisconsin.

Helene Nelson,

Secretary

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Executive Summary

About nine percent of Wisconsin residents, or 450,000 people, have ever been diagnosed with asthma (Family Health Survey, 2001). Asthma is a chronic lung condition characterized by ongoing airway inflammation that results in recurring acute episodes (attacks) of breathing problems such as coughing, wheezing, chest tightness, and shortness of breath.

People with asthma require frequent interaction with the healthcare system—routine office visits and an individualized medication regimen are needed to effectively manage asthma. Although preventable, inpatient hospitalizations and emergency department visits resulting from asthma exacerbations are common and expensive. Among Wisconsin residents in 2002, there were over 5,000 asthma hospitalizations and over 22,000 asthma hospital emergency department visits. Charges for these visits totaled $36 million and $13.3 million, respectively, in 2002 alone.

The past few years have shown some promising asthma trends–the prevalence of asthma in Wisconsin has remained fairly stable over the past eight years and, asthma inpatient hospitalization and mortality rates have declined slightly over the past three years. Despite these positive developments, certain sub-populations continue to be disproportionately affected by asthma.

The African American population in Wisconsin has the highest prevalence of asthma, is hospitalized at six times the rate of the white population, and has a four-fold higher rate of asthma mortality. The Native American population also has an elevated asthma prevalence and asthma hospitalization rate compared to the white population. Children, particularly those four years and younger, have the highest hospitalization and emergency department visit rates. Among children, males appear to be more severely impacted by asthma, but after puberty, females appear to be disproportionately affected by asthma as reflected in higher asthma prevalence, emergency department visits, inpatient hospitalizations and mortality rates.

Certain counties in the state carry a higher burden of asthma. Milwaukee County had both the highest asthma hospitalization (2000-2002) and asthma hospital emergency department visit rates (2002). Menominee County had the second highest rates for both of these measures of asthma health care utilization. The highest asthma mortality rate (1990-2001) was seen in Buffalo County.

In Wisconsin, there appears to be room for improvement in the medical management of people with asthma. Although over 80 percent of Wisconsin adults with current asthma reported experiencing asthma symptoms in the past 30 days, only 48 percent reported having a routine health care visit for their asthma in the past twelve months and only 40 percent reported daily medication use. Fourteen percent of adults with current asthma reported at least one emergency department visit for asthma and 18 percent reported that their asthma limited their ability to carry out their usual activities in the past year (Behavioral Risk Factor Survey, 2002). Better medical management of asthma, including routine healthcare visits and appropriate medication, according to the National Asthma Education and Prevention Program's Diagnosis and Management Guidelines (1997 and 2002) could improve these statistics.

Avoiding asthma triggers, such as allergens and irritants, is an important component of preventing asthma attacks. Data presented in this report show that middle school children with asthma are more likely to be exposed to environmental tobacco smoke (Youth Tobacco Survey, 2003). Education about asthma trigger control for individuals with asthma and their caregivers should be a critical part of future asthma interventions.

In addition to better individual asthma management, systemic changes such as improved asthma management in schools and preventive measures in the workplace are needed. Asthma action plan usage by schools, training of school staff and increased understanding of the Wisconsin inhaler law could improve the quality of life of children with asthma in schools. Greater awareness of work-related asthma and appropriate preventive measures could help to reduce adult-onset asthma and missed time from work.

The *Healthy People 2010* national health goals set forth by the US Department of Health and Human Services include seven goals specifically targeted towards improving the lives of people with asthma:

- Reduce asthma deaths
- Reduce hospitalizations for asthma
- Reduce hospital emergency department visits for asthma
- Reduce activity limitations among persons with asthma
- Reduce the number of school or work days missed by persons with asthma due to asthma
- Increase the proportion of persons with asthma who receive formal patient education, including information about community and self-help resources, as an essential part of the management of their condition
- Increase the proportion of persons with asthma who receive appropriate asthma care according to the National Asthma Education and Prevention Program (NAEPP) guidelines

In addition, the State Health Plan, *Healthiest Wisconsin 2010*, has two specific objectives that relate to asthma:

- Reduce the incidence of illness and death from respiratory diseases related to or aggravated by environmental and occupational exposures
- Reduce by 50 percent the incidence of illness and death related to chemical and biological contaminants in the home

Although Wisconsin appears to be making progress on some of these *Healthy People 2010* and *Healthiest Wisconsin 2010* objectives, many points of intervention remain to improve the quality of life for people with asthma. The *Wisconsin Asthma Plan*, released in 2003, (available at www.chawisconsin.org) will serve as a blueprint for working to achieve these goals. Regular updates of the *Burden of Asthma in Wisconsin* will be published to track progress towards improving the lives of all people affected by asthma in Wisconsin.

Key Findings

Prevalence

- In 2002, about 12 percent of Wisconsin adults reported having ever been told by a health care provider that they have asthma (Behavioral Risk Factor Survey (BRFS), 2002). Nine percent of adults reported currently having asthma with females having higher current asthma prevalence (10 percent) than males (7 percent).
- Among adult females, obese females (body mass index greater than 30) had a higher prevalence of current asthma (14 percent) than non-obese females (9 percent) (BRFS, 2002).
- About 8 percent of Wisconsin children have ever been diagnosed with asthma (Family Health Survey (FHS), 2001). Among children, those aged 11-17 years had the highest lifetime asthma prevalence (11 percent) from 1997-2000 (FHS). About 6 percent of children in Wisconsin currently have asthma (BRFS, 2002).
- People living in households below the poverty level are more likely to have ever been diagnosed with asthma (12 percent) compared with people living in households above the poverty level (8 percent) (FHS, 1997-2000).

Asthma Severity

- About 43 percent of adults with asthma in Wisconsin had an asthma attack in the past 12 months. Adult females were more likely than adult males to experience an asthma attack (45 percent versus 39 percent) (BRFS, 2002).
- Almost 80 percent of adults with current asthma experienced asthma symptoms in the past twelve months (BRFS, 2002).

Health Care Utilization

- Less than 50 percent of adults with current asthma had routine healthcare visits for their asthma in the past 12 months (BRFS, 2002).
- About 37 percent of adults with asthma under 65 years of age and 88 percent of adults with asthma over 65 years of age reported receiving a flu shot in the past year (BRFS, 2002).
- Fourteen percent of adults with current asthma reported having at least one emergency department visit in the past 12 months (BRFS, 2002).
- In 2002, there were 22,418 hospital emergency department (ED) visits for asthma among Wisconsin residents with a rate of 42.0 visits per 10,000 population. Females had a higher asthma ED visit rate than males (45.5 versus 38.3 visits per 10,000). Children less than four years had the highest hospital ED visit rate (91.4 visits per 10,000 population).
- The average length of stay in 2002 for an asthma hospitalization was 3.0 days with an average charge of $6,942.
- About half of all asthma hospitalizations were paid for by the Medicare and Medicaid programs (2002).

- Asthma hospitalizations in Wisconsin have been decreasing over the past three years. In 2002, there were 5,181 asthma hospitalizations among Wisconsin residents with a rate of 9.6 asthma hospitalizations per 10,000 population compared to 11.2 asthma hospitalizations per 10,000 in 1999.
- Children under four years of age had the highest hospitalization rate with 28.0 hospitalizations per 10,000 in 2002.
- The asthma hospitalization rate among African Americans was about six times higher than the rate among the white population (42.5 versus 7.0 hospitalizations per 10,000 in 2002).
- A seasonal pattern was observed for both asthma inpatient hospitalizations and asthma hospital emergency department visits, with a distinct increase in utilization in the months of September and October (2002).
- Milwaukee and Menominee counties had the highest rates of asthma hospitalizations (2000-2002) and asthma hospital ED visits (2000) in Wisconsin.
- Almost 4 percent of the eligible Medicaid population had at least one ambulatory visit for asthma. Of recipients that had any ambulatory visits for asthma, the average number of visits was two per recipient per year. The providers most often seen for ambulatory asthma visits were pediatricians and general or family practitioners.
- Among Medicaid recipients, on average, 69 percent received appropriate asthma medication in 2001 according to modified HEDIS criteria.
- About 3 percent of all emergency department (ED) visits among the Medicaid population were for asthma. Of Medicaid recipients who had any ED visits for asthma, the average number was 1.4 visits per year.

Mortality

- On average, about 100 asthma deaths occur annually in Wisconsin. The average mortality rate from 1990-2001 was 18.5 asthma deaths per million population, with females having a higher rate than males (20.1 versus 16.3 deaths per million).
- Adults sixty-five years of age and older had the highest average asthma mortality rate at 60.3 deaths per million from 1990-2001.
- The average asthma mortality rate among African Americans (61.5 deaths per million) was four times the rate among the white population (16.5 deaths per million) from 1990-2001.

Key Findings

Other Findings

- Health-related quality of life was lower in adults with asthma compared to adults without asthma (BRFS, 2002). Eighteen percent of adults with current asthma reported at least one activity-limited day in the past 12 months due to their asthma (BRFS, 2002).
- The majority of Wisconsin schools do not have a full-time registered nurse and many do not provide asthma training to other school staff who may help students to administer their asthma medications (Elementary School Asthma Survey, 2003 and School Health Education Profile, 2002).
- Middle school children who had an asthma attack in the past 12 months were more likely to have spent time in the same room as someone who smoked in the past seven days than either children without asthma or children with asthma but who did not have an asthma attack in the past 12 months (Youth Tobacco Survey, 2003).
- Cases of work-related asthma appear to be under-estimated when using worker's compensation data for surveillance. New approaches, such as population-based and industry-specific surveys, will be needed to improve surveillance for work-related asthma in Wisconsin.

Introduction

Asthma is a chronic lung condition characterized by ongoing airway inflammation that results in recurring acute episodes (attacks) of breathing problems such as coughing, wheezing, chest tightness, and shortness of breath. It is one of the most common chronic diseases of children (Adams and Marano, 1995) in the United States, one of the leading causes of school absenteeism, a leading cause of preventable hospitalizations (Pappas et al., 1997) and a leading work-related lung disease (Centers for Disease Control and Prevention, 1983).

Asthma is a costly condition both in terms of personal suffering and expenditures. In 1998, asthma-related costs in the United States were estimated to total $11.3 billion. Direct costs for care of asthma patients were $7.5 billion, with hospitalizations comprising the largest single part of those costs. Indirect costs, including lost time and productivity at work, amounted to $3.8 billion (National Heart, Lung, and Blood Institute (NHLBI), January 1999). In Wisconsin, the annual cost of asthma is estimated to be $209 million with direct medical expenditures accounting for $119 million and indirect costs accounting for about $90 million (Asthma and Allergy Foundation of America web site, November 2003).

While many industrial agents have been shown to cause asthma in adult workers (Chan-Yeung, 1993), currently, there is little definitive information on what causes asthma in children or adults unexposed to work-related asthma inducers. In people who have asthma, exacerbations or asthma attacks can be caused by known triggers such as environmental tobacco smoke, dust mites, cockroaches, pet dander, mold and dampness, and cold air.

Although asthma cannot be cured, symptoms can be controlled by appropriate medical care combined with efforts to control exposure to triggers, allowing people with asthma to lead full and active lives largely unrestricted by their asthma. The National Asthma Education and Prevention Program's (NAEPP) *Guidelines for the Diagnosis and Management of Asthma* (NHLBI, 1997) and *Update on Selected Topics* (NHLBI, 2002) are considered the standards for optimal asthma care. To assist clinicians in the implementation of these guidelines, the NAEPP has published *Key Clinical Activities for Quality Asthma Care* (Morbidity and Mortality Weekly Report, March 28, 2003). The ten key activities outlined in the report are:

- Establish asthma diagnosis
- Classify severity of asthma
- Schedule routine follow-up care
- Assess for referral to specialty care
- Recommend measures to control asthma triggers
- Treat or prevent all comorbid conditions
- Prescribe medications according to severity
- Monitor use of $ß_2$-agonist drugs
- Develop a written asthma management plan
- Provide routine education on patient self-management

Introduction

These guidelines and key clinical activities are essential in achieving the highest quality of care possible for those with asthma. However, there are persons with asthma who do not have sufficient access to routine care or needed medications. Such disparities, as well as disparities in the burden of asthma among persons of racial and ethnic minorities and of low-income households, must also be addressed to improve the quality of life for all who have asthma.

Asthma: A Public Health Priority

Asthma has been identified as a public health priority both nationally and in Wisconsin. The national health plan, *Healthy People 2010*, and the implementation plan of the state public health plan, *Healthiest Wisconsin 2010* (available at: www.dhfs.state.wi.us/Health/StateHealthPlan), both have objectives related to asthma.

The Wisconsin Asthma Coalition, a statewide group working to address asthma in Wisconsin, has created a detailed blueprint for addressing asthma in the state. The *Wisconsin Asthma Plan*, which was released in October 2003, represents the fruition of asthma surveillance and planning efforts begun in Wisconsin in 1993. The Plan was produced through collaboration between the Wisconsin Department of Health and Family Services (DHFS), the Children's Health Alliance of Wisconsin, the US Centers for Disease Control and Prevention (CDC), and many partners and stakeholders across Wisconsin. The *Wisconsin Asthma Plan* outlines specific goals and objectives, coupled with measurable action steps, that can be taken to achieve these goals. The Plan can be viewed and downloaded in its entirety at www.chawisconsin.org.

The Wisconsin Asthma Coalition, the development of the Wisconsin Asthma Plan and Wisconsin's asthma surveillance activities are funded in part through a cooperative agreement awarded to the Wisconsin Department of Health and Family Services by the CDC in 2001 (*Addressing Asthma from a Public Health Perspective*, Award Number U59/CCU520846). This award for a three-year planning and surveillance grant ends in September 2004. The Department will apply to secure funding for implementation of the *Wisconsin Asthma Plan* in 2004. In addition, the Wisconsin Asthma Coalition will work with its partners to seek additional means of support and avenues of collaboration in its efforts to reduce the burden of asthma in Wisconsin.

The Burden of Asthma in Wisconsin

As partners across Wisconsin work towards implementing new asthma interventions, it is critical to know the current burden of asthma to both target and measure the impact of interventions. *The Burden of Asthma in Wisconsin* is the first comprehensive statewide asthma surveillance report in Wisconsin and represents information collected from several data sources with the help of key stakeholders. This report will serve as a source of baseline data and as a guide to help focus asthma interventions and policies. The *Burden of Asthma in Wisconsin* will be issued regularly by the DHFS to monitor trends in asthma prevalence, management and health care utilization; to incorporate new data as they become available and to track progress towards improving the lives of all people affected by asthma in Wisconsin.

Prevalence data are an important part of understanding the burden of asthma in Wisconsin. These data allow us to estimate how many people have asthma and to identify who in the population has asthma.

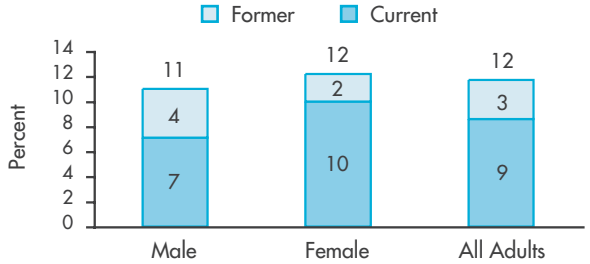
Measuring Asthma Prevalence

Measuring the prevalence of asthma is difficult because it is a disease characterized by intermittent symptoms and varying degrees of severity. Although it is considered to be a chronic disease, people can be diagnosed with asthma at some point in their lives but may not continue to actively exhibit symptoms. Asthma prevalence is generally estimated from survey data. Survey respondents answering "yes" to the question *"Did a doctor (or other health professional) ever tell you (or any household member) that you (they) had asthma?"* results in an estimate of lifetime asthma prevalence or the proportion of the population that has ever been diagnosed with asthma (Council of State and Territorial Epidemiologists, 1998).

Because not everyone who is diagnosed with asthma will continue to show symptoms of asthma, there is the need for the distinction between lifetime, current and former asthma prevalence. Current asthma prevalence is the proportion of the population that currently has asthma. Former asthma prevalence is the proportion of the population that was diagnosed with asthma but no longer show symptoms. Both former and current asthma prevalence are estimated by a survey question asking people who reported that they had ever been diagnosed with asthma if they still have asthma. If they answer "yes" they are classified as having current asthma. If they answer "no" they are classified as having former asthma.

To further illustrate the relationship between lifetime, current and former asthma prevalence, data from the Wisconsin Behavioral Risk Factor Survey (BRFS) are presented in Figure 1. In 2002, 12 percent of all Wisconsin adults reported lifetime diagnosis of asthma. Of these, 9 percent reported that they currently have asthma. Three percent of Wisconsin adults have been diagnosed with asthma sometime in their lifetime but no longer have asthma (the former asthma prevalence). A higher proportion of males have ever been diagnosed with asthma but report no longer having asthma. Females have both higher current and lifetime asthma prevalence. In this report, to fully describe the burden of asthma in Wisconsin, both current and lifetime asthma prevalence data are presented.

Figure 1. Current, Former, and Lifetime Asthma Prevalence by Sex, Wisconsin Adults, 2002.



Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Who Has Asthma in Wisconsin?

Lifetime Asthma Prevalence

Data Sources

The Wisconsin Family Health Survey (FHS) has been conducted annually by the DHFS Bureau of Health Information since 1989. It is an annual, statewide phone survey that produces estimates representative of the household population of Wisconsin on health-related topics. The FHS is the only source of historical lifetime asthma prevalence data in Wisconsin. Nationwide estimates of lifetime asthma prevalence have been available since 1997 from the National Health Interview Survey (NHIS) conducted by the National Center for Health Statistics.

The Behavioral Risk Factor Survey (BRFS) is also an annual, statewide phone survey, but, unlike the FHS, the BRFS is conducted by all states and thus national estimates for the same questions are available for comparison. Like the FHS, the BRFS asks about lifetime asthma prevalence but, also includes a question that allows estimation of current asthma prevalence. Asthma prevalence questions have been included on the Wisconsin BRFS since 1999.

The lifetime asthma prevalence estimates from the FHS and from the BRFS differ slightly, which is likely due to differences in respondent sampling and wording of questions. As the FHS has been administered in Wisconsin since 1989, this section of the report uses lifetime asthma prevalence data from the FHS to provide a historical perspective on asthma prevalence. Current asthma prevalence estimates from the BRFS are presented in the next section of the report. See Appendix A for more detailed information about these surveys.

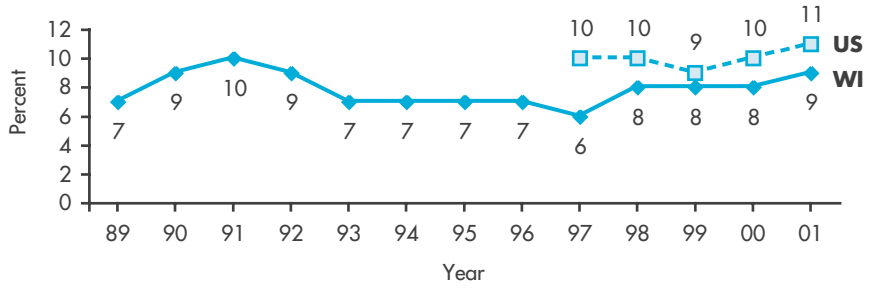
Survey Questions:

- The asthma question on the FHS used to determine lifetime asthma prevalence is: *"Has anyone in your household ever been told by a doctor that they have asthma?"*
- The question on the NHIS differs slightly: *"Have **you** ever been told by a doctor **or other health professional** that you have asthma?"*

Prevalence Estimates

Although there has been some variability in the lifetime asthma prevalence in Wisconsin over the past 13 years (Figure 2), estimates have remained fairly stable (FHS, 1989-2001). The highest prevalence, with 10 percent of individuals living in households reporting having ever been told by a doctor that they have asthma, occurred in 1991. After 1991, there was a slight downward trend until 1998 when self-reported prevalence began to increase to the 2001 prevalence of 9 percent. In general, Wisconsin lifetime asthma prevalence is lower than the US lifetime asthma prevalence. Wording differences between the FHS and the NHIS asthma questions may account for this difference in lifetime asthma prevalence rates.

Figure 2. Lifetime Asthma Prevalence, Wisconsin and the United States, 1989-2001.



Data Sources: 1989-2001 Family Health Survey, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services and 1997-2001 National Health Interview Survey

Lifetime asthma prevalence by sex, race, ethnicity and age group from 1989-2000 are presented in Table 1 to show the distribution of asthma prevalence by sub-populations and to provide a historical perspective on lifetime asthma prevalence. Rates were calculated by four-year intervals to have a sufficient number of respondents by sub-population.

Who Has Asthma in Wisconsin?

Lifetime Asthma Prevalence

Table 1. Lifetime Asthma Prevalence by Sex, Race, Ethnicity and Age Group, Four Year Intervals, Wisconsin, 1989-2000.

	Lifetime Asthma Prevalence					
	1989-1992		1993-1996		1997-2000	
	Rate (%)	95 % C.I.* ± (%)	Rate (%)	95 % C.I. ± (%)	Rate (%)	95 % C.I. ± (%)
Sex						
Male	8	(--)	6	(--)	7	(--)
Female	9	(--)	7	(--)	8	(--)
Race/Ethnicity**						
Non-Hispanic White	9	(--)	7	(--)	7	(--)
Non-Hispanic African American	10	(2)	10	(1)	11	(1)
Non-Hispanic Asian	2	(2)	3	(2)	7	(3)
Non-Hispanic Native American	11	(5)	10	(4)	9	(3)
Hispanic	7	(2)	7	(2)	11	(2)
Age (years)						
0-4	6	(1)	5	(1)	5	(1)
5-10	10	(1)	7	(1)	9	(1)
11-17	11	(1)	10	(1)	11	(1)
18-34	9	(1)	8	(1)	9	(1)
35-64	9	(1)	6	(--)	7	(1)
65+	9	(1)	6	(1)	6	(1)
Overall Wisconsin Population	**9**	**(--)**	**7**	**(--)**	**8**	**(--)**

* C.I. = Confidence Interval (the range within which there is a 95% chance that the true prevalence estimate lies). Add and subtract the percentage value in the C.I. column to the prevalence rate to get the 95% confidence interval for the prevalence rate.

** The Hispanic category includes all races where the individual indicated that they were of Hispanic origin.

Note: A dash (--) indicates 0.5 percent or less

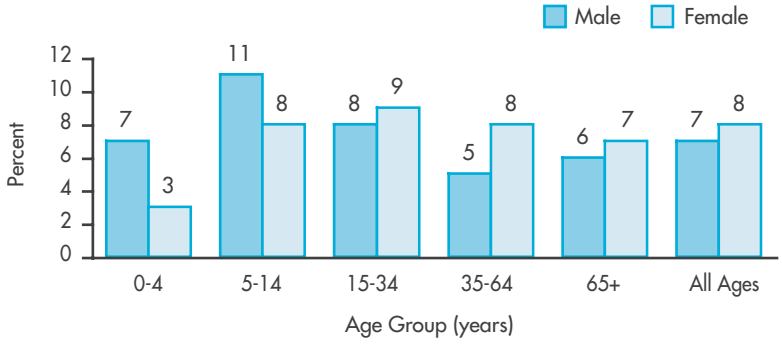
Data Source: 1989-2000 Family Health Survey, Bureau of Health Information, Division of Health Care Financing, Wisconsin Division of Health and Family Services

In Wisconsin, non-Hispanic African Americans and non-Hispanic Native Americans had a slightly higher lifetime asthma prevalence than non-Hispanic whites from 1997-2000. Although non-Hispanic Asians had a lower prevalence of asthma than non-Hispanic whites from 1989-1996, their rate has since increased to the non-Hispanic white population rate. Hispanics in Wisconsin have had a similar rise in lifetime asthma prevalence, though the prevalence in the Hispanic population now exceeds the prevalence in the non-Hispanic white population. The prevalence estimates for racial and ethnic minority populations in Wisconsin are more variable than for the white population because of their smaller populations and thus, lower probability of being sampled for the survey. As reflected in the wider 95% confidence intervals in Table 1 for these groups, rates are based upon fewer individuals responding to the survey. Lifetime asthma prevalence estimates in these populations should therefore be interpreted with caution.

Children aged 11-17 years consistently had the highest lifetime asthma prevalence (10 - 11 percent) from 1989 to 2000. Children aged 0-4 years had the lowest prevalence of asthma (5 - 6 percent) which may be due to the difficulty in establishing an asthma diagnosis in very young children. After age seventeen there is a decline in lifetime asthma prevalence.

Females in Wisconsin have a higher lifetime asthma prevalence than males. When these data are examined by age group (Figure 3), an interesting pattern emerges whereby males have a higher prevalence of asthma before puberty and females have a higher prevalence after puberty. This prevalence pattern is consistent with national data (NHLBI, 1999) and is reflected in patterns of health care utilization seen in Wisconsin.

Figure 3. Lifetime Asthma Prevalence by Age and Sex, Wisconsin, 1992-2000.



Data Source: 1992-2000 Family Health Survey, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Asthma lifetime prevalence estimates from the Wisconsin Family Health Survey were calculated for metropolitan counties in Wisconsin (Table 2). Four years of data were combined to have sufficiently large sample sizes. Non-metropolitan counties were grouped into DHFS public health regions to calculate the prevalence in these regions, excluding the metropolitan counties. See Appendix D for a map of DHFS public health region boundaries.

Who Has Asthma in Wisconsin?

Lifetime Asthma Prevalence

Table 2. Lifetime Asthma Prevalence by Wisconsin Metropolitan¥ Counties and Non-Metropolitan Counties Grouped by DHFS Public Health Region, 1997-2000.

	Lifetime Asthma Prevalence		
	Rate (%)	95 % C.I.* ± (%)	Estimated Number of People with Asthma
Metropolitan Counties			
Brown	7	(1)	13,000
Calumet	4	(3)	2,000
Chippewa	5	(3)	3,000
Dane	11	(1)	40,000
Douglas	9	(4)	3,000
Eau Claire	8	(3)	6,000
Kenosha	9	(2)	13,000
La Crosse	6	(2)	6,000
Marathon	6	(2)	7,000
Milwaukee	9	(1)	81,000
Outagamie	7	(2)	10,000
Ozaukee	4	(2)	3,000
Pierce	9	(4)	3,000
Racine	11	(3)	18,000
Rock	8	(2)	10,000
St. Croix	6	(3)	3,000
Sheboygan	10	(2)	11,000
Washington	5	(2)	6,000
Waukesha	8	(2)	26,000
Winnebago	7	(2)	10,000
Non-Metropolitan Counties Grouped by DHFS Region**			
South	8	(1)	32,000
Southeast	6	(2)	11,000
Northeast	6	(1)	31,000
West	5	(1)	15,000
North	8	(1)	29,000
Wisconsin	**8**	**(--)**	**392,000**

¥ Twenty Wisconsin counties have been designated metropolitan counties by the federal Office of Management and Budget. Counties are designated as metropolitan because they either 1) have a central city of at least 50,000 people, or 2) are adjacent and economically linked to a "central city" county.

* C.I. = Confidence Interval (the range within which there is a 95% chance that the true prevalence estimate lies). Add and subtract the percentage value in the C.I. column to the prevalence rate to get the 95% confidence interval for the prevalence rate.

** Data from non-metropolitan counties are reported by DHFS public health regions due to small number of sampled households in these counties.

Note: A dash (--) indicates 0.5 percent or less

Data Source: 1997-2000 Family Health Survey, Bureau of Health Information, Division of Health Care Financing, Wisconsin Division of Health and Family Services

Current Asthma Prevalence

Data Source

In Wisconsin, the Behavioral Risk Factor Survey (BRFS) is the only survey that allows estimation of the current asthma prevalence - the proportion of the population that currently has asthma. Adults are identified as having current asthma if they answer "Yes" to both adult survey questions listed below. Two questions were added to the 2002 BRFS to determine current asthma prevalence among children. The child asthma questions added were asked at the household level, therefore, individual level data, such as the ages of the children and their race or ethnicity, are not available. Current asthma prevalence estimates are presented in this section of the report. See Appendix B for detailed BRFS prevalence data from 1999-2002.

Survey Questions:

Adults

- *"Have you ever been told by a doctor, nurse or other health professional that you had asthma?"*
- *"Do you still have asthma?"*

Children

- *"Earlier you said there were children age 17 or younger living in your household. How many of these children have ever been diagnosed with asthma?"*
- *"Does this child/How many of these children still have asthma?"*

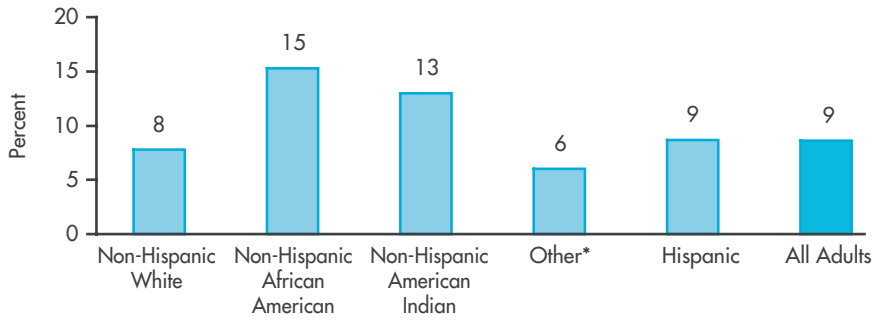
Prevalence Estimates among Adults

To be able to present current asthma prevalence by race and ethnicity, data from the 2001 and 2002 BRFS surveys were combined so that rates would be based on a sufficiently large sample population (Figure 4). The non-Hispanic African American population had a significantly higher current asthma prevalence than the non-Hispanic white population. The differences in current asthma prevalence between other race and ethnic groups were not significant. The prevalence estimates for the non-Hispanic American Indian and Hispanic populations should be interpreted with caution due to the small number of survey respondents from these groups.

Who Has Asthma in Wisconsin?

Current Asthma Prevalence

Figure 4. Current Asthma Prevalence by Race and Ethnicity, Wisconsin Adults, 2001-2002.

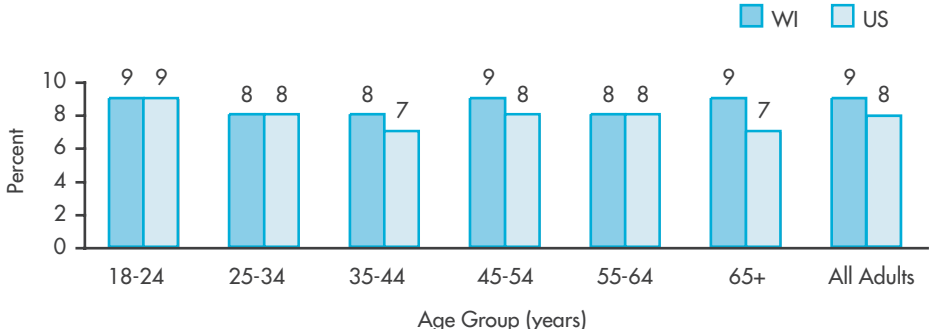


* The 'Other' category is comprised of non-Hispanic Asians, non-Hispanic Native Hawaiians, non-Hispanic Pacific Islanders, multiracial respondents and individuals that reported being of other races. These groups were combined due to low number of sampled respondents (n < 100).

Data Source: 2001 and 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Current asthma prevalence was similar among adult age groups. Current asthma prevalence was slightly higher in Wisconsin adults in 2002 than the median prevalence in US adults (Figure 5).

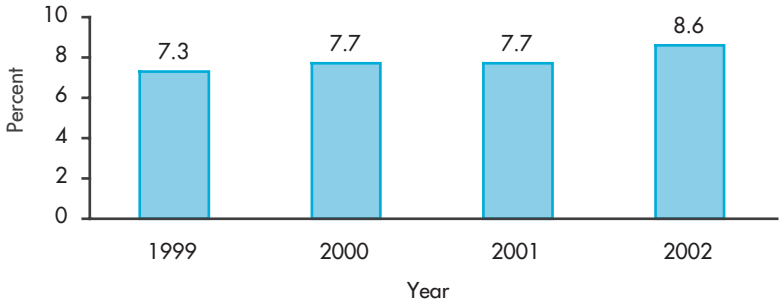
Figure 5. Current Asthma Prevalence by Ten Year Age Groups, Wisconsin and US Adults, 2002.



Data Sources: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services and 2002 Behavioral Risk Factor Surveillance System Online Prevalence Data

Current asthma prevalence in Wisconsin remained relatively stable from 1999 to 2002. Although the prevalence was slightly higher in 2002, this rate was not statistically significantly elevated compared to 2001 (Figure 6).

Figure 6. Current Asthma Prevalence, Wisconsin Adults, 1999-2002.*



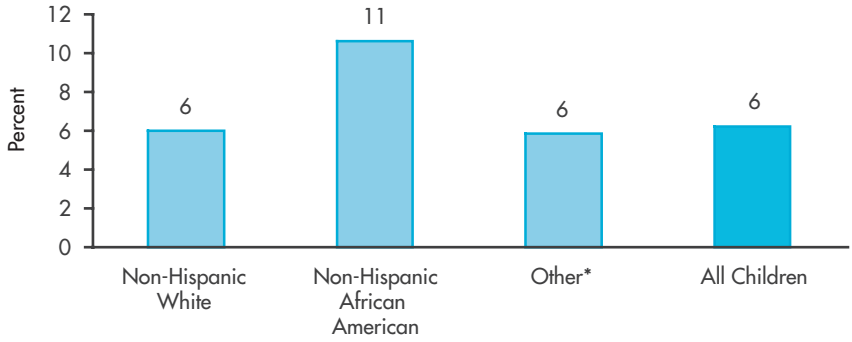
* The asthma questions on the 1999 and 2000 BRFS were worded slightly differently ("Did a doctor ever tell you that you have asthma?"), so estimates from these years are not directly comparable with estimates from 2001 and 2002.

Data Source: 1999-2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Prevalence Estimates among Children

Among children aged 17 years and younger, current asthma prevalence is about 6 percent. Current asthma prevalence among children examined by race of the adult household respondent is presented in Figure 7. Children living in a household where a non-Hispanic African American responded to the survey had higher asthma prevalence than where the adult respondent was non-Hispanic white (11 percent versus 6 percent).

Figure 7. Current Asthma Prevalence among Children by Race of Household Adult Respondent, Wisconsin, 2002.



* The 'Other' category is comprised of non-Hispanic Asians, non-Hispanic Native Hawaiians, non-Hispanic Pacific Islanders, non-Hispanic Native Americans, non-Hispanic Alaskan Natives, Hispanics, multiracial respondents and individuals that reported being of other races. These groups were combined due to low number of survey respondents (n < 100).

Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

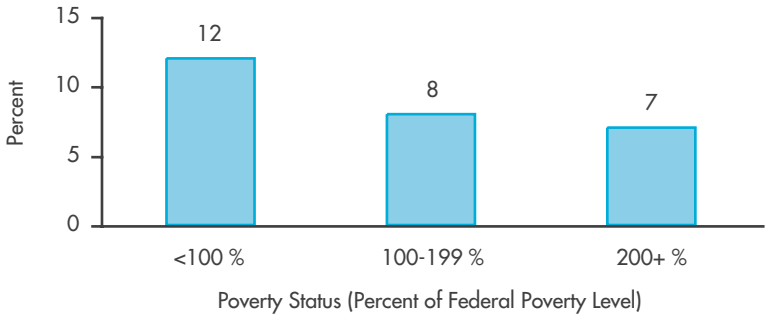
Who Has Asthma in Wisconsin?

Risk Factors Associated with Elevated Asthma Prevalence

Poverty

Various studies have found that poverty is associated with higher asthma prevalence (Duran-Tauleria and Rona, 1999 and Litonjua et al., 1999). Poverty status can be determined by comparing household level of income relative to the household size with annual poverty guidelines established by the federal government. Households at or below the 100 percent federal poverty level are considered to be living in poverty. In Wisconsin, as has been seen in other populations, poverty is correlated with a higher prevalence of asthma (Figure 8).

Figure 8. Lifetime Asthma Prevalence by Poverty Status, Wisconsin, 1997-2000.

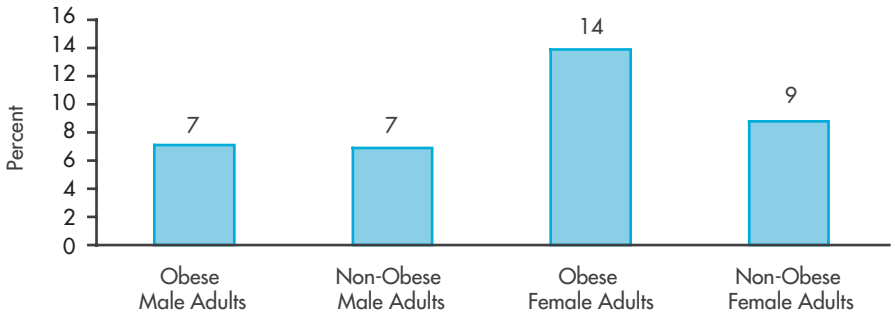


Data Source: 1997-2000 Family Health Survey, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Obesity

In 1998, The National Institutes of Health (NIH) released clinical guidelines for the identification of overweight and obesity (NIH, 1998) based on the body mass index (BMI), an individual's weight in kilograms divided by their height in meters, squared. According to the guidelines, individuals with a BMI greater than or equal to 30 are considered to be obese. In Wisconsin, 14 percent of obese female adults versus 9 percent of non-obese female adults report current asthma (Figure 9). Obesity does not appear to be correlated with current asthma prevalence in males in Wisconsin, consistent with data found in other populations (Chen et al., 2002).

Figure 9. Current Asthma Prevalence by Obesity Status and Sex, Wisconsin Adults, 2002.



Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Who Has Asthma in Wisconsin?

School Survey Data

Most surveys conducted to determine disease prevalence, such as the Family Health Survey and the Behavioral Risk Factor Survey, are administered to adults. To better understand asthma prevalence in school-aged children, asthma questions were included in both the Youth Tobacco Survey (YTS) and the Youth Risk Behavior Survey (YRBS). These surveys are administered at schools to children in selected classrooms. The data from these surveys allow exploration between asthma and student-level risk factors, such as exposure to environmental tobacco smoke. It is not known how accurately children respond to these questions about their asthma, thus, prevalence estimates from these surveys should be interpreted with caution.

Data Source

In 2003, for the first time, asthma questions were included in the Wisconsin Youth Tobacco Survey (YTS), a survey administered in a random sample of public middle schools every year and public high schools every other year. In 2003, the YTS was administered in public middle schools only. Two asthma-related questions were asked that correspond with questions that are asked on adult surveys—one question to determine lifetime asthma prevalence and the other to determine the asthma attack rate (data presented on page 20). A small proportion of middle school children, 5 percent, responded inconsistently to the two asthma questions. Only data from children who responded consistently are presented, resulting in more conservative asthma prevalence estimates.

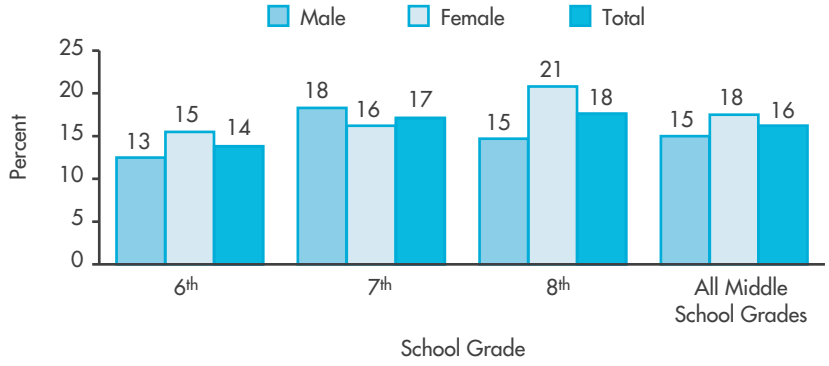
Survey Questions:

- *"Have you ever been told by a doctor, nurse or other health professional that you have asthma?"*
- *"During the past 12 months, have you had an episode of asthma or an asthma attack?"*

Prevalence Estimates among Public Middle School Students

Overall, 16 percent of middle school children reported having ever being told by a health professional that they have asthma. This lifetime asthma prevalence is higher than the estimate of 11 percent reported by adults for children of this age group (FHS, 2000-2001). This elevated asthma prevalence estimate is similar in magnitude to results seen on other middle school student surveys such as the Michigan YTS (2001). Females reported higher lifetime asthma prevalence than males overall among Wisconsin middle school children though, there was substantial variation in prevalence by sex by grade (Figure 10).

Figure 10. Lifetime Asthma Prevalence by Grade and Sex, Public Middle School Students, Wisconsin, 2003.



Data Source: 2003 Youth Tobacco Survey, Bureau of Chronic Disease Prevention and Health Promotion, Division of Public Health, Wisconsin Department of Health and Family Services

Who Has Asthma in Wisconsin?

School Survey Data

Data Source

In 2003, for the first time, an asthma question was included in the Wisconsin Youth Risk Behavior Survey (YRBS), a survey administered in a random sample of public high schools every other year in Wisconsin. Estimates of lifetime asthma prevalence can be determined from this question. Only one asthma question was asked on this survey consequently, consistency to responses across questions could not be used to validate survey responses as was done with the Youth Tobacco Survey asthma questions.

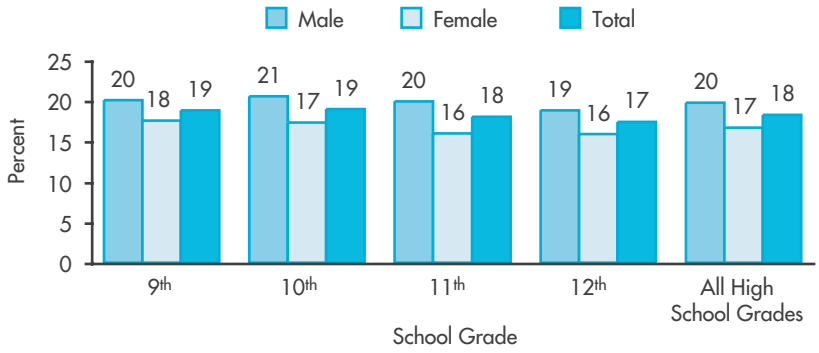
Survey Question:

- *"Have you ever been told by a doctor, nurse or other health professional that you have asthma?"*

Prevalence Estimates among Public High School Students

The self-reported overall lifetime asthma prevalence across all grades of 18 percent is higher than the prevalence for this age group from surveys completed by adults, but similar to the overall prevalence in middle school children of 16 percent from the 2003 Youth Tobacco Survey (Figure 11). Among high school students, males reported having a higher prevalence of diagnosis of asthma in all grades. This result is inconsistent with other prevalence data available by age and sex that indicates that after puberty, asthma prevalence is higher in females. For both sexes, prevalence appeared to decrease slightly after the 10th grade.

Figure 11. Lifetime Asthma Prevalence by Grade and Sex, Public High School Students, Wisconsin, 2003.



Data Source: 2003 Youth Risk Behavior Survey, Wisconsin Department of Public Instruction

To characterize the experience of individuals with asthma in Wisconsin, data in this section are presented on the frequency of symptoms, severity of asthma, rate of asthma attacks and health-related quality of life of people with asthma.

Asthma Symptoms and Severity

Individuals with asthma show varying degrees of disease severity. In 1997, the National Heart, Lung and Blood Institute released the National Asthma Education and Prevention Program's Guidelines for the Diagnosis and Management of Asthma. The report included the framework in Table 3 for classifying patient asthma severity (NHLBI, 1997) which is based on symptoms and lung function testing. Level of asthma severity, steps 1 through 4, determines the recommended course and intensity of asthma management.

Table 3. Classification of Asthma Severity, National Asthma Education and Prevention Program Guidelines for the Diagnosis and Management of Asthma, 1997.

	Clinical Features before Treatment*		
	Symptoms**	Nighttime Symptoms	Lung Function
Step 4 Severe Persistent	• Continual symptoms • Limited physical activity • Frequent exacerbations	Frequent	• FEV_1 or PEF ≤60% predicted • PEF variability >30%
Step 3 Moderate Persistent	• Daily symptoms • Daily use of inhaled short-acting $beta_2$-agonist • Exacerbations after activity • Exacerbations ≥2 times a week; may last days	>1 time a week	• FEV_1 or PEF >60%-<80% predicted • PEF variability >30%
Step 2 Mild Persistent	• Symptoms >2 times a week but <1 time a day • Exacerbations may affect activity	>2 times a month	• FEV_1 or PEF ≥80% predicted • PEF variability 20-30%
Step 1 Mild Intermittent	• Symptoms ≤2 times a week • Asymptomatic and normal PEF between exacerbations • Exacerbations brief (from a few hours to a few days); intensity may vary	≤2 times a month	• FEV_1 or PEF ≥80% predicted • PEF variability <20%

* The presence of one of the features of severity is sufficient to place a patient in that category. An individual should be assigned to the most severe grade in which any feature occurs. The characteristics noted in this figure are general and may overlap because asthma is highly variable. Furthermore, an individual's classification may change over time.

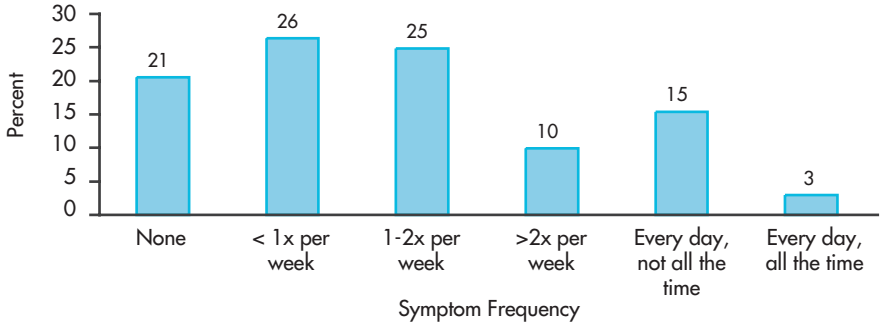
** Patients at any level of severity can have mild, moderate, or severe exacerbations. Some patients with intermittent asthma experience severe and life-threatening exacerbations separated by long periods of normal lung function and no symptoms.

How Severe is Asthma in Wisconsin?

Asthma Symptoms and Severity

Self-reported frequency of symptoms from the 2002 Behavioral Risk Factor Surveillance Survey allows for estimation of the severity of asthma among Wisconsin adults with current asthma (see Appendix F for the survey question). Almost 80 percent of Wisconsin adults with current asthma reported experiencing asthma symptoms in the past 30 days (Figure 12). Over 50 percent experienced asthma symptoms more than once a week. Utilizing the guidelines in Table 3, approximately 10 percent of Wisconsin adults with asthma have mild persistent asthma and about 18 percent have more severe classifications of asthma—15 percent likely have moderate persistent asthma and 3 percent have severe persistent asthma based on self-reported frequency of symptoms. These estimates do not take into account that some individuals' symptoms may be controlled by medication usage.

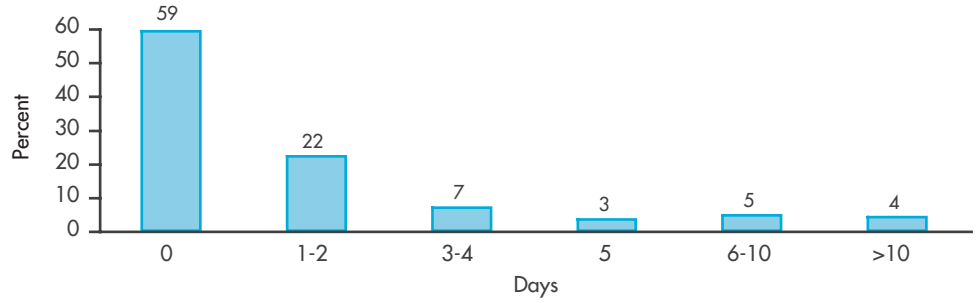
Figure 12. Frequency of Asthma Symptoms among Adults with Current Asthma in the past 30 Days, Wisconsin, 2002.



Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Of the adults who reported any asthma symptoms in the past 30 days (Figure 13), over 40 percent had trouble staying asleep because of their symptoms at least one day out of the past 30 days (see Appendix F for the survey question). Nocturnal awakening due to asthma is one of the key indicators that asthma is not being optimally controlled (NHLBI, 1997).

Figure 13. Number of Days had Trouble Sleeping among Adults with Asthma Symptoms in the past 30 Days, Wisconsin, 2002.



Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

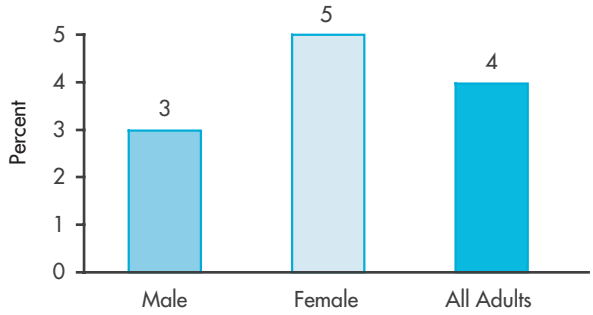
Asthma Attack Rate

Not everyone who has asthma will experience an asthma attack. Asthma attacks are a function of both asthma severity and appropriate asthma management. The asthma attack rate is the number of people in the total population who had at least one asthma attack in the previous year. The asthma attack rate is a crude indicator of how many people have uncontrolled asthma and are at risk for a poor outcome from asthma such as hospitalization (NCHS, 2003). In Wisconsin, there are two surveys that ask respondents with asthma if they have had an asthma attack in the past year: the Behavioral Risk Factor Survey (BRFS) and the Youth Tobacco Survey (YTS). Data from both surveys are presented in this section. For more detailed information on these surveys, see Appendix A.

Adults

When Wisconsin adults with current asthma were asked *"During the past 12 months, have you had an episode of asthma or an asthma attack?,"* 45 percent of females and 39 percent of males answered "yes". This translates into asthma attack rates by sex of 5 percent and 3 percent, respectively (Figure 14). Overall, 43 percent of Wisconsin adults with current asthma or 4 percent of all Wisconsin adults experienced an asthma attack in the past 12 months.

Figure 14. Asthma Attack Rate by Sex, Wisconsin Adults, 2002.



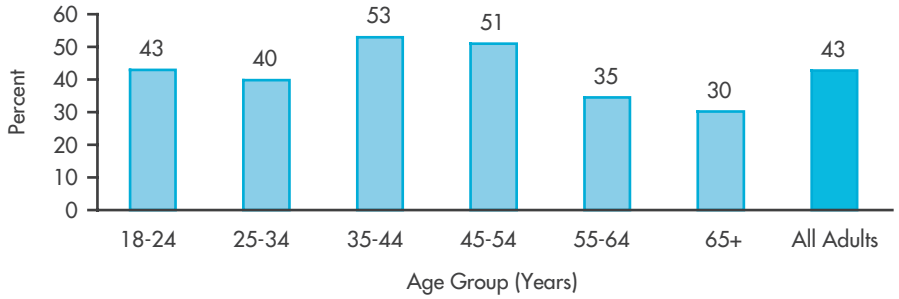
Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

The percent of adults with current asthma that experienced an asthma attack varied somewhat by age group. The highest rates were seen in adults aged 35-54, with lower rates in younger and older adult age groups (Figure 15).

How Severe is Asthma in Wisconsin?

Asthma Attack Rate

Figure 15. Percent of Adults with Current Asthma that Experienced an Asthma Attack in the Past Year by Age Group, Wisconsin, 2002.



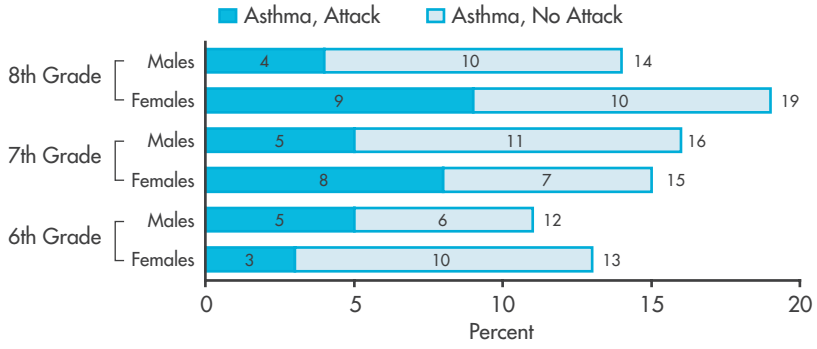
Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Asthma attack rates by race and ethnicity are not presented due to small sample size. It appears from the BRFS data that a similar percent of non-Hispanic white and non-Hispanic African American adults with asthma (the populations for which sufficient sample sizes were available) reported having experienced an asthma attack in the past year: 44 percent and 45 percent, respectively.

Children

The asthma attack rate among public middle school children is available from the 2003 YTS, discussed earlier. Six percent of public middle school children reported having an asthma attack in the past 12 months. Male middle school children reported a higher rate of asthma attacks in the past 12 months in the 6th grade, but in the higher grades, females reported a higher asthma attack rate. This crossover in asthma severity around puberty between males and females is consistent with patterns of health care utilization in this age group and findings in other populations (Agency for Healthcare Research and Quality, 2003).

Figure 16. Asthma Attack Rate by Grade and Sex, Public Middle School Students, Wisconsin, 2003.*



* Some children who responded that they had asthma on the YTS lifetime asthma prevalence question answered "Don't know" on the YTS asthma attack question, so the asthma prevalence rates presented in Figures 10 and 16 do not correspond exactly.

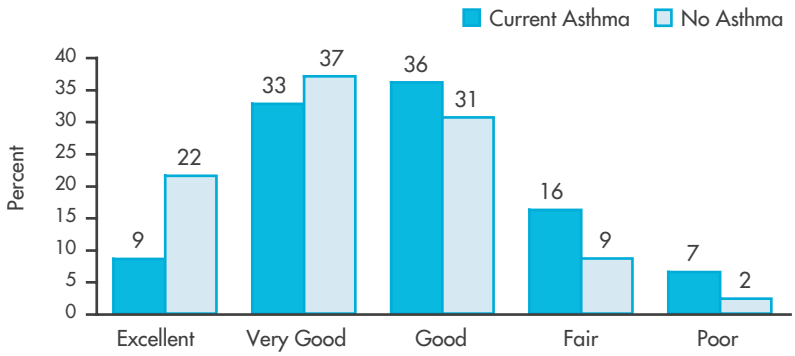
Data Source: 2003 Youth Tobacco Survey, Bureau of Chronic Disease Prevention and Health Promotion, Division of Public Health, Wisconsin Department of Health and Family Services

Health-Related Quality of Life

To understand the impact of asthma on individuals' lives, it is important to look beyond traditional measures of morbidity to a wider definition of health. Health-related quality of life is a concept that refers to an individual or group's perceived mental or physical health over time and provides information about the day-to-day experience of individuals or groups living with disease (CDC, 2000). Although it is difficult to measure, several standardized questions have been developed to assess health-related quality of life.

One of the standard survey questions used to evaluate individual's perception of health is *"Would you say that in general your health is excellent, very good, good, fair or poor?"* In Wisconsin, adults with current asthma were less likely to report their health as being excellent and much more likely to report fair or poor health than adults without asthma, according to the 2002 BRFS. Twenty-three percent of individuals with current asthma reported fair or poor health compared to 11 percent of individuals without asthma. This is similar to what has been found nationwide (Ford et al., 2003).

Figure 17. Perceived Health by Asthma Status, Wisconsin Adults, 2002.



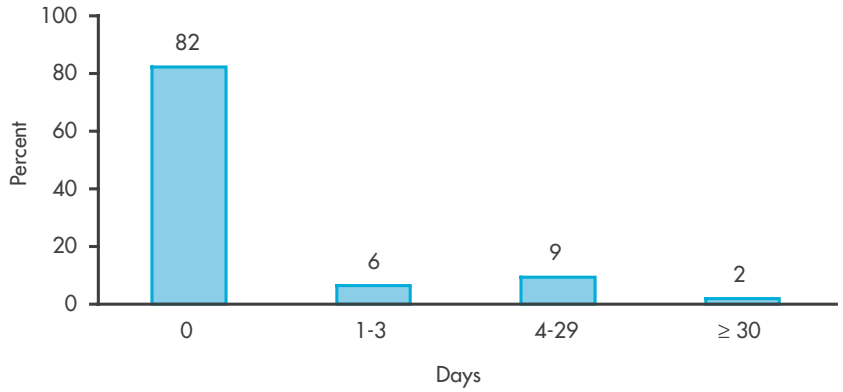
Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

How Severe is Asthma in Wisconsin?

Health-Related Quality of Life

Another aspect of quality of life is the ability to carry out the activities of daily living. When adults who currently have asthma were asked how many days in the past 12 months they were unable to work or carry out their usual activities because of their asthma, 18 percent reported having experienced at least one day in the past year where their activities were limited by asthma (Figure 18). Two percent reported more than 30 days of activity limitation in the past twelve months.

Figure 18. Number of Activity Limited Days in the Past 12 Months Due to Asthma, Wisconsin Adults, 2002.*



*Due to rounding, responses do not add up to 100%.

Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

How Well is Asthma Managed in Wisconsin?

There are many aspects of successful asthma management. In addition to appropriate medication and routine healthcare, avoidance of triggers, as well as systemic preventative and supportive measures are necessary. This section of the report presents data on how well asthma is managed in Wisconsin.

Environmental Triggers

Many environmental factors have been shown to trigger asthma attacks in people with asthma. Triggers include dust mites, cockroach allergens and environmental tobacco smoke - the smoke to which non-smokers are exposed to when they are in the indoor environment with smokers (Daisey et al., 1994). In addition to these indoor triggers, outdoor air pollutants such as ozone and particulate matter pollution can also trigger asthma attacks in susceptible individuals (Daggett et al, 2000). Although correlating outdoor air pollutant concentrations with asthma has been difficult to do historically, efforts are underway at the DHFS to better track the effects of outdoor pollutants on asthma and results will be published in future editions of this report.

Chronic exposure to environmental tobacco smoke is associated with exacerbation of asthma in school-aged children (Institute of Medicine, 2000). The 2003 Wisconsin Youth Tobacco Survey included questions on both asthma and exposure to environmental tobacco smoke in middle school children thus, providing some information on the relation between asthma and environmental tobacco smoke exposure in Wisconsin children. See Appendix A for additional survey information.

Survey Questions:

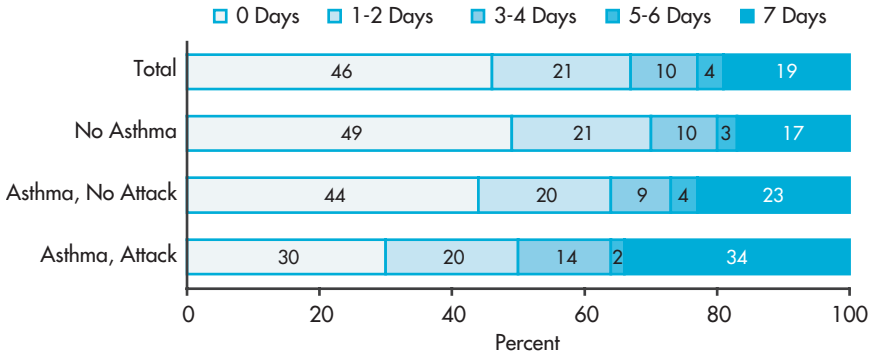
- *"During the past 7 days, on how many days were you in the same room with someone who was smoking cigarettes?"*
- *"Does anyone who lives with you now smoke cigarettes?"*

Fifty-four percent of middle school children reported spending at least one of the past seven days in the same room with someone smoking cigarettes (Figure 19). Children with asthma were more likely to report spending any of the last 7 days in the same room as someone who smoked. Among children with asthma, those who had an asthma attack in the past 12 months were more likely to have spent all of the past 7 days in the same room as someone who was smoking (34 percent versus 23 percent). Seventy percent of children who have asthma and had an attack in the past 12 months spent at least one day of the past seven days in the same room as someone who smoked.

How Well is Asthma Managed in Wisconsin?

Environmental Triggers

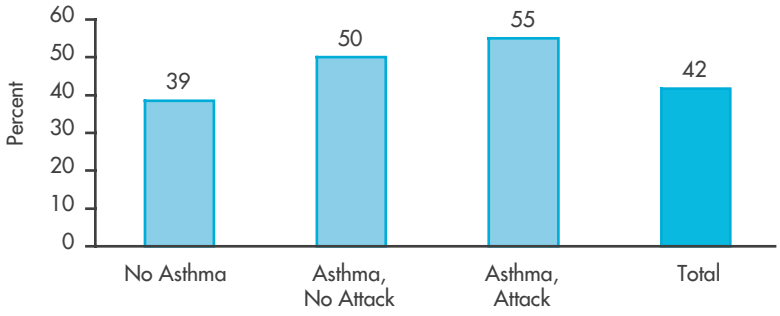
Figure 19. Number of the Past Seven Days Spent in the Same Room as Someone who was Smoking by Asthma Attack Status, Public Middle School Students, Wisconsin, 2003.



Data Source: 2003 Youth Tobacco Survey, Bureau of Chronic Disease Prevention and Health Promotion, Division of Public Health, Wisconsin Department of Health and Family Services

In Wisconsin, 42 percent of middle school children reported currently living with someone who smokes (Figure 20). Among children with asthma this rate was higher. Of children ever diagnosed with asthma but who did not have an attack in the past 12 months, 50 percent live with someone who smokes. Among middle school children with asthma who had an asthma attack in the past 12 months, 55 percent currently live with someone who smokes cigarettes.

Figure 20. Percent of Public Middle School Students Currently Living with Someone who Smokes Cigarettes by Asthma Attack Status, Wisconsin, 2003.



Data Source: 2003 Youth Tobacco Survey, Bureau of Chronic Disease Prevention and Health Promotion, Division of Public Health, Wisconsin Department of Health and Family Services

Asthma Management in Schools

School-aged children have the highest prevalence of asthma in Wisconsin and spend a significant portion of their time in school. School management of students with asthma is integral both to the educational experience of these children as well as to their health. The Centers for Disease Control and Prevention (CDC) has published a document entitled "Strategies for Addressing Asthma Within a Coordinated School Health Program" which outlines specific actions that schools can take to manage students with asthma (CDC, 2002). The six strategies identified by the report are:

1. Establish management and support systems for asthma-friendly schools.
2. Provide appropriate school health and mental health services for students with asthma.
3. Provide asthma education and awareness programs for students and school staff.
4. Provide a safe and healthy school environment to reduce asthma triggers.
5. Provide safe, enjoyable physical education and activity opportunities for students with asthma.
6. Coordinate school, family, and community efforts to better manage asthma symptoms and reduce school absences among students with asthma.

Middle and High Schools

In Wisconsin, the School Health Education Profile (SHEP), a survey administered by the Department of Public Instruction every two to four years, allows monitoring of public middle and high school health education and policy characteristics. The SHEP is a random sample survey and results are generalizable to all public middle and high schools in Wisconsin. For more information on the SHEP, please see Appendix A.

The 2002 SHEP included a question addressing several of the components of school asthma management recommended by the CDC. School principals were asked *"Does your school implement each of the following school-based asthma management activities?"* for the activities presented in Table 4.

The responses of school principals to the SHEP asthma management question indicate that Wisconsin public middle and high schools are successfully addressing some of the CDC recommendations, but other areas of school asthma management could use improvement. Although 83 percent of school principals reported that their schools identify and track all students with asthma and 96 percent of schools assure immediate access to asthma medication, only 17 percent of schools have a full-time registered nurse and only 51 percent of principals report that school staff receive education about asthma. An asthma action plan, a written asthma management plan based on individual's symptoms, is a recommended tool to facilitate asthma management. Forty-six percent of school principals reported that their schools obtain and use asthma action plans for all students with asthma.

How Well is Asthma Managed in Wisconsin?

Asthma Management in Schools

Table 4. Asthma Management in Public Middle and High Schools according to School Principals, Wisconsin, 2002.

	% Yes		
	Middle Schools	**High Schools**	**All Schools**
Provide a full-time registered nurse, all day every day	13	22	17
Identify and track all students with asthma	84	84	83
Obtain and use an asthma action plan (or Individualized Health Plan) for all students with asthma	44	53	46
Assure immediate access to medications as prescribed by a physician and approved by parents (allow students to self-carry inhalers)	96	97	96
Provide intensive case management for students with asthma who are absent 10 days or more per year	33	34	33
Educate school staff about asthma	51	49	51
Educate students with asthma about asthma management	43	40	43
Teach asthma awareness to all students in at least one grade	27	31	30
Encourage full participation in physical education and physical activity when students with asthma are doing well	99	98	99
Provide modified physical education and physical activities as indicated by the student's Asthma Action Plan	77	78	78

Data Source: 2002 School Health Education Profile, School Principal Survey, Wisconsin Department of Public Instruction

Elementary Schools

To better understand how elementary schools in Wisconsin manage and support their students with asthma, the Bureau of Environmental Health (Division of Public Health, DHFS), partnered with the American Lung Association of Wisconsin to develop and mail a survey, similar to the SHEP, to all public and private elementary school principals in the state. A slight modified version of the survey was sent to school health nurses. Unlike the SHEP, the Elementary School Asthma Survey was not a random survey, but instead was sent to all elementary school principals and elementary school nurses in the state. The survey response rate was low (28 percent) so the results of the survey should be interpreted with caution. Results of this survey may not be generalizable to all elementary schools in Wisconsin. Selected data from this survey is summarized below. See Appendix A for more detailed information about the survey.

As was the case with middle and high schools, very few elementary schools had a full-time school nurse (Table 5). Only 1 percent of private school principals and 11 percent of public school principals responding to the survey reported having a full-time school nurse at their school. Eighty-five percent of private school principals and 30 percent of public school principals reported having no school nurse at their school. School nurses, based on responses to the separate school nurse survey, were more likely to be employed at schools with more than 500 students. As school nurses primarily work at public schools, their responses to the survey are most representative of public elementary schools.

Most elementary school principals (79 percent) reported that their schools use asthma action plans for their students with asthma. Public school principals were more likely than private school principals to report that asthma education was provided to school staff and volunteers. More private school principals reported student education about asthma than public school principals, though, asthma was not included in the student curriculum for most schools. School nurse responses were similar to the responses of public school principals.

Table 5. Asthma Management in Elementary Schools by Survey Respondent, Wisconsin, 2003.

	% Yes			
	School Nurses (n=260)	**Public Schools** (n=263)	**Private Schools** (n=188)	**All Schools** (n=451)
Provide a full-time registered nurse, all day every day	-	11	1	7
Use asthma action plans for students with asthma	87	86	69	79
Provide any asthma education or training to school staff or volunteers about asthma	78	72	33	55
Educate students about asthma as a chronic disease as part of the curriculum	12	17	23	19
Students taught to emotionally support their peers with asthma as part of the curriculum	6	7	15	10

Data Source: 2003 Elementary School Asthma Survey, American Lung Association of Wisconsin

How Well is Asthma Managed in Wisconsin?

Asthma Management in Schools

In 1999, Wisconsin passed a student inhaler law (Wisconsin Statute 118.291) allowing students with asthma to possess and self-administer asthma medication at school, with physician and guardian written permission on file at the school (see Box 1). Wisconsin is one of 17 states to date that have enacted a student inhaler law.

Box 1. Wisconsin Inhaler Law - Wisconsin Statute 118.291

118.291 Asthmatic pupils; possession and use of inhalers.

(1) While in school, at a school–sponsored activity or under the supervision of a school authority, an asthmatic pupil may possess and use a metered dose inhaler or dry powder inhaler if all of the following are true:

(a) The pupil uses the inhaler before exercise to prevent the onset of asthmatic symptoms or uses the inhaler to alleviate asthmatic symptoms.

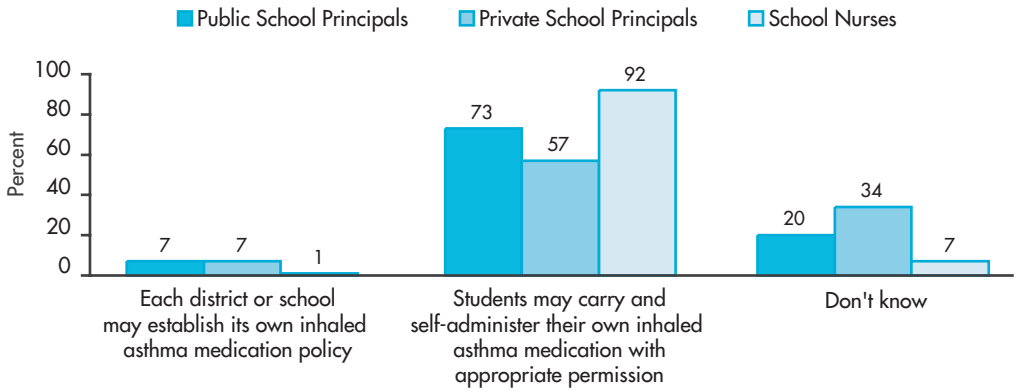
(b) The pupil has the written approval of the pupil's physician and, if the pupil is a minor, the written approval of the pupil's parent or guardian.

(c) The pupil has provided the school principal with a copy of the approval or approvals under par. (b).

(2) No school district, school board or school district employee is civilly liable for damage to a pupil caused by a school district employee who prohibits a pupil from using an inhaler because of the employee's good faith belief that the requirements of sub. (1) had not been satisfied or who allows a pupil to use an inhaler because of the employee's good faith belief that the requirements of sub. (1) had been satisfied.

To assess familiarity with the asthma inhaler law, Elementary School Asthma Survey respondents were asked what their understanding was of the Wisconsin laws concerning inhaled asthma medications (Figure 21). Although the majority of school principals were familiar with the inhaler law, 26 percent of school principals were not sure of Wisconsin's laws concerning inhaled asthma medications. Schools nurses were very familiar (92 percent) with the asthma inhaler law. Lack of familiarity with the Wisconsin inhaler law among school principals highlights a potential area that could be targeted to improve school asthma management.

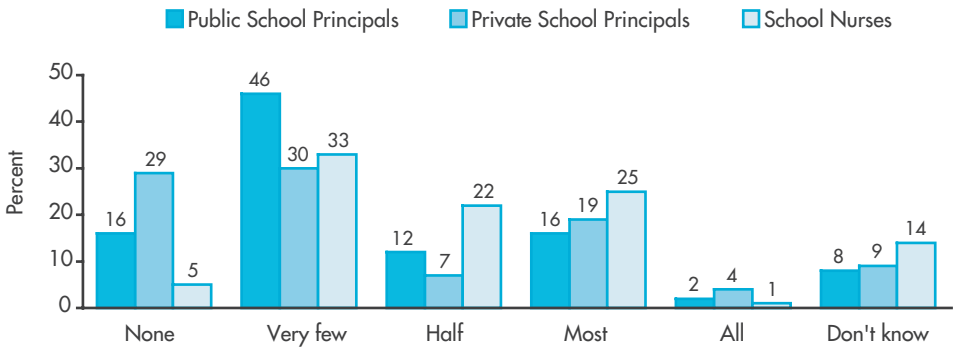
Figure 21. Familiarity with the Wisconsin Inhaler Law by Survey Respondent, Wisconsin, 2003.



Data Source: 2003 Wisconsin Elementary School Asthma Survey, American Lung Association of Wisconsin

When asked what proportion of students in their schools carry and self-administer their own inhaled asthma medication, less than 5 percent of survey respondents reported that all students carry and administer their own inhaled asthma medications (Figure 22). Twenty percent of survey respondents reported that most of the students at their schools carry and self-administer their own asthma medication. It appears that many elementary school children are not carrying and self-administering their own asthma medication.

Figure 22. Proportion of Elementary Schools Students with Asthma who Carry and Self-Administer their Inhaled Asthma Medications by Survey Respondent, Wisconsin, 2003.



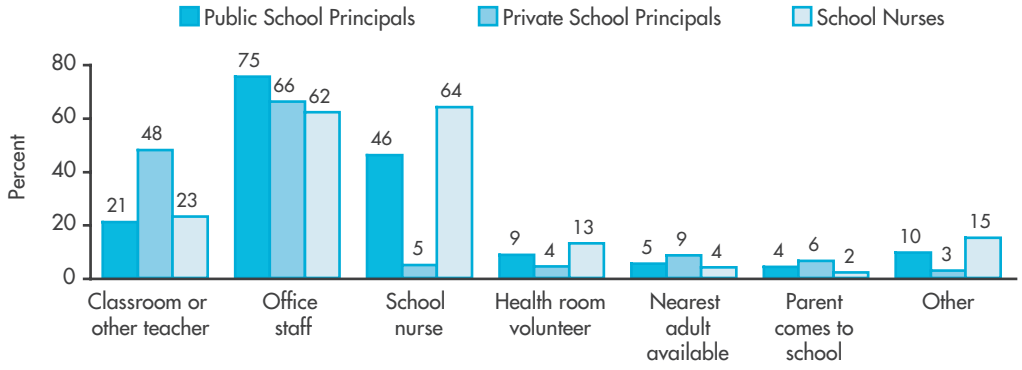
Data Source: 2003 Wisconsin Elementary School Asthma Survey, American Lung Association of Wisconsin

How Well is Asthma Managed in Wisconsin?

Asthma Management in Schools

In both private and public elementary schools, principals who responded to the survey reported that the adult most likely to assist students with asthma medication administration was an office staff member. School nurses also reported a high level of assistance by office staff but indicated that at schools where they were employed, they were the adult most likely to help students with asthma administer their medication (Figure 23).

Figure 23. Adults who Assist Elementary School Students with Asthma Medication Administration by Survey Respondent, Wisconsin, 2003.



Data Source: 2003 Wisconsin Elementary School Asthma Survey, American Lung Association of Wisconsin

As most students do not administer their own asthma medication (see Figure 22), training of the adults who help children to administer their asthma medication is essential. In another question asked on the survey (data not shown), when asked which school staff receive asthma education training, 40 percent of public school and 14 percent of private school principals reported training of office staff at their schools. This lack of training by the adults most likely to administer medication to children with asthma highlights another area that could be improved in school management of asthma.

How is Health Care for Asthma Utilized in Wisconsin?

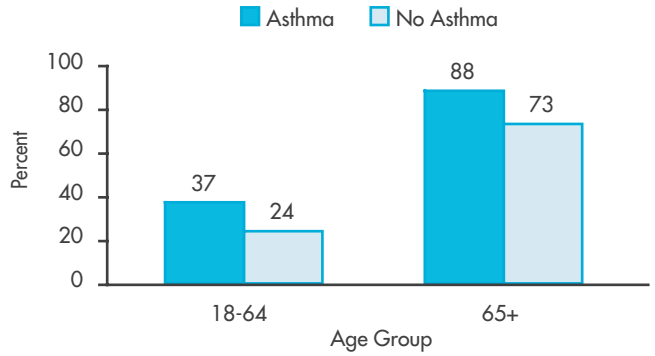
Asthma is a disease that involves extensive interaction with the health care system ranging from medication prescriptions and routine office visits to emergency department visits and inpatient hospitalizations. This section of the report presents data on asthma health care utilization in Wisconsin, ordered by both increasing cost and severity.

Flu Shots

The Centers for Disease Control (CDC) recommends that adults aged 65 years and over and people with asthma, along with other groups who are at increased risk of complications from influenza, receive an annual influenza vaccination (flu shot) (CDC, 2003). The 2002 BRFS included a question asking adults whether in the past 12 months they had received a flu shot, allowing calculation of flu shot rates among adults with asthma.

Adults aged 65 years and older were much more likely than younger adults to report having received a flu shot in the past year (Figure 24). In this older age group, adults with current asthma were even more likely to have received a flu shot in the past year than adults without asthma (88 percent versus 73 percent). Adults with asthma aged 18-64 years were more likely to report having had a flu shot in the past year (37 percent versus 24 percent) than those without asthma. Among adults 65 and over, compliance with the CDC annual flu shot recommendation is very high. Adults aged 64 and younger with asthma may benefit from having a higher rate of influenza vaccinations.

Figure 24. Flu Shots among Adults with Current Asthma by Age Group, Wisconsin, 2002.



Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

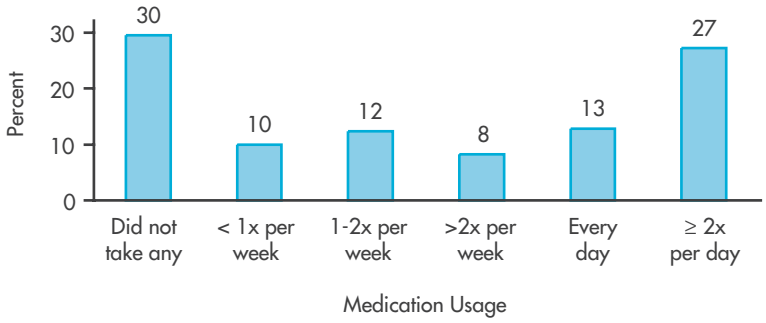
How is Health Care for Asthma Utilized in Wisconsin?

Asthma Medication Usage

Appropriate medication is an important component of asthma management. Use of daily asthma medication is recommended unless individuals are characterized as having the mildest form of asthma, 'mild intermittent asthma', that is, having symptoms less than two days a week or less than two nights a month (NHLBI, 2002).

Among people who currently have asthma in Wisconsin, asthma medication usage is quite variable (Figure 25). Thirty percent of individuals who currently have asthma reported not taking any prescribed asthma medication in the past 30 days. Sixty percent took asthma medications less than once a day. In contrast, 27 percent of people with current asthma used asthma medication two or more times per day in the past 30 days. See Appendix F for wording of the BRFS survey question.

Figure 25. Frequency of Asthma Medication Usage by Adults with Current Asthma in the Past 30 Days, Wisconsin, 2002.



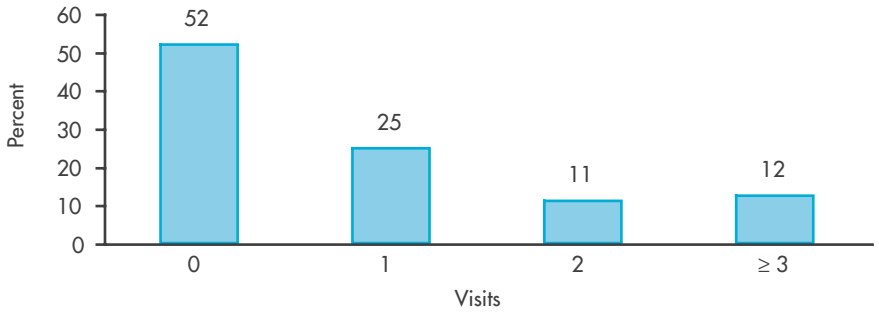
Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Asthma Office Visits

Routine health care visits are an essential part of appropriate asthma care. According to the NAEPP guidelines, patients with mild intermittent or mild persistent asthma that has been under control for at least 3 months should be seen by a clinician about every 6 months. Patients with uncontrolled and/or severe persistent asthma and those needing additional supervision to help them follow their treatment plan need to be seen more often by a clinician (NHLBI, 1997).

Wisconsin adults with current asthma were asked on the 2002 BRFS, *"During the past 12 months how many times did you see a doctor, nurse or other health professional for a routine checkup for your asthma?"* The majority of survey respondents (52 percent) indicated having had no routine checkup visits for asthma in the past year (Figure 26). This lack of routine health care highlights another area where there is room for improvement of asthma management in Wisconsin.

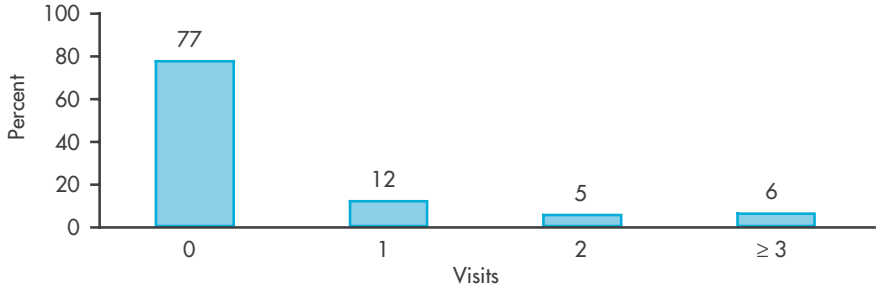
Figure 26. Routine Health Care Visits for Asthma, Wisconsin Adults, 2002.



Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

When asked if they had a visited a health professional for urgent treatment of worsening symptoms of asthma in the past 12 months (see Appendix F for question wording), 23 percent of Wisconsin adults with current asthma reported having one or more such visits (Figure 27).

Figure 27. Health Care Visits for Worsening Asthma Symptoms, Wisconsin Adults, 2003.



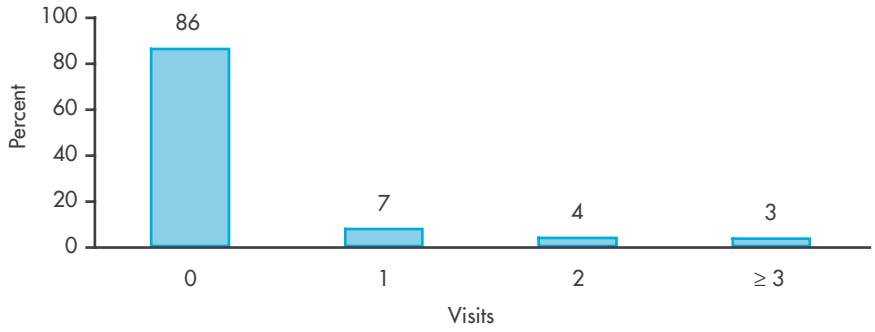
Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

How is Health Care for Asthma Utilized in Wisconsin?

Emergency Department Visits

With proper health care management, the majority of emergency department (ED) visits for asthma are preventable. A visit to the emergency department is often an indication of inadequate long-term management of asthma or inadequate plans for handling exacerbations (NHLBI, 1997). In Wisconsin, 14 percent of people who reported having current asthma on the 2002 BRFS visited the ED at least once in the past 12 months (see Appendix F for question wording) due to their asthma. Four percent visited the ER twice and 3 percent visited the ED three or more times in the past 12 months (Figure 28).

Figure 28. Asthma-Related Emergency Department Visits in the Past 12 Months among Adults with Current Asthma, Wisconsin, 2002.



Data Source: 2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Hospital Emergency Department Visit Rates

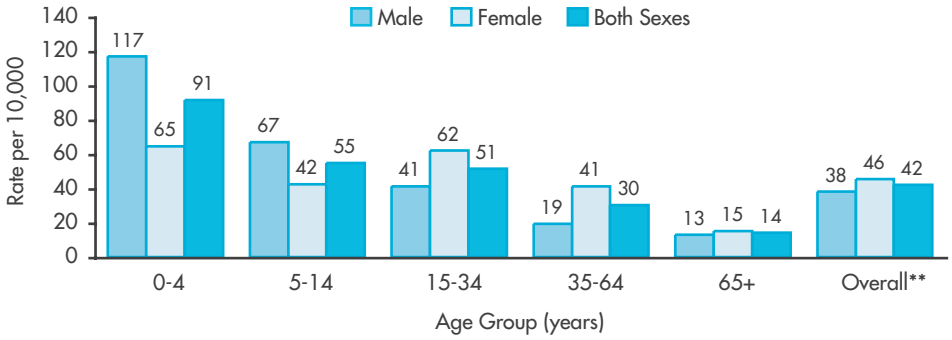
Hospital emergency department data collected by the Bureau of Health Information (BHI), Department of Health and Family Services were used to calculate statewide rates of asthma hospital emergency department (ED) visits. 2002 was the first year BHI collected hospital ED data. Hospitals were not required to report race or ethnicity of patients; thus, rates for these populations could not be calculated. It is important to note that these rates were calculated using the number of asthma hospital ED visits and are not based on the number of people who represent these visits. That is, because an individual may have had more than one ED visit during the year, the number of actual individuals who had asthma visits is not captured in these rate calculations.

How is Health Care for Asthma Utilized in Wisconsin?

A total of 22,418 hospital ED visits with asthma as the principal diagnosis occurred among Wisconsin residents in 2002, with an overall visit rate of 42.0 per 10,000 population. These visits represent about 1.5 percent of all hospital emergency department visits in the state. The total charges associated with these visits were $13.3 million. The average charge for an asthma hospital emergency department visit in 2002 was $510.

Children aged 0-4 years had the highest asthma hospital ED visit rate with 91.4 visits per 10,000 population (Figure 29). The hospital ED visit rate appears to decline with age—adults sixty-five and older had the lowest hospital ED visit rate with 14.3 visits per 10,000 in 2002. Young males have a higher rate of emergency department visits than young females; male children aged 0-4 years had a hospital ED visit rate almost double the rate of females (117.0 versus 64.6 per 10,000). After age fourteen, females have a higher rate of ED visits and this trend continues for the rest of the life span, though the disparity between the sexes is diminished in the oldest age group (15.1 versus 13.1 per 10,000).

Figure 29. Asthma Hospital Emergency Department Visit Rates by Age and Sex, Wisconsin Residents, 2002.*



* Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00 - 493.92)

** Age-adjusted to the year 2000 US standard population

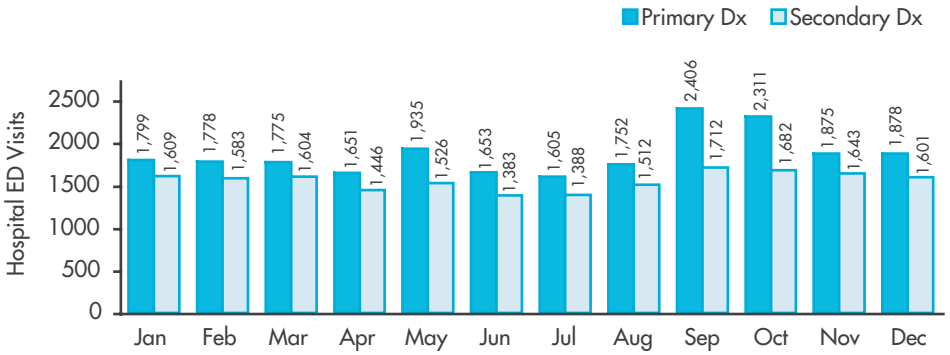
Data Source: 2002 Hospital Emergency Department Visit Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services

How is Health Care for Asthma Utilized in Wisconsin?

Emergency Department Visits

Asthma hospital emergency department visits varied slightly by month with a notable peak in the months of September and October (Figure 30). This seasonal fluctuation in asthma health care utilization is consistently observed across populations. Hospital ED visits with asthma as the secondary diagnosis showed a similar, but less dramatic peak.

Figure 30. Hospital Emergency Department Visits for Asthma as the Principal or Secondary Diagnosis by Month, Wisconsin Residents, 2002.*



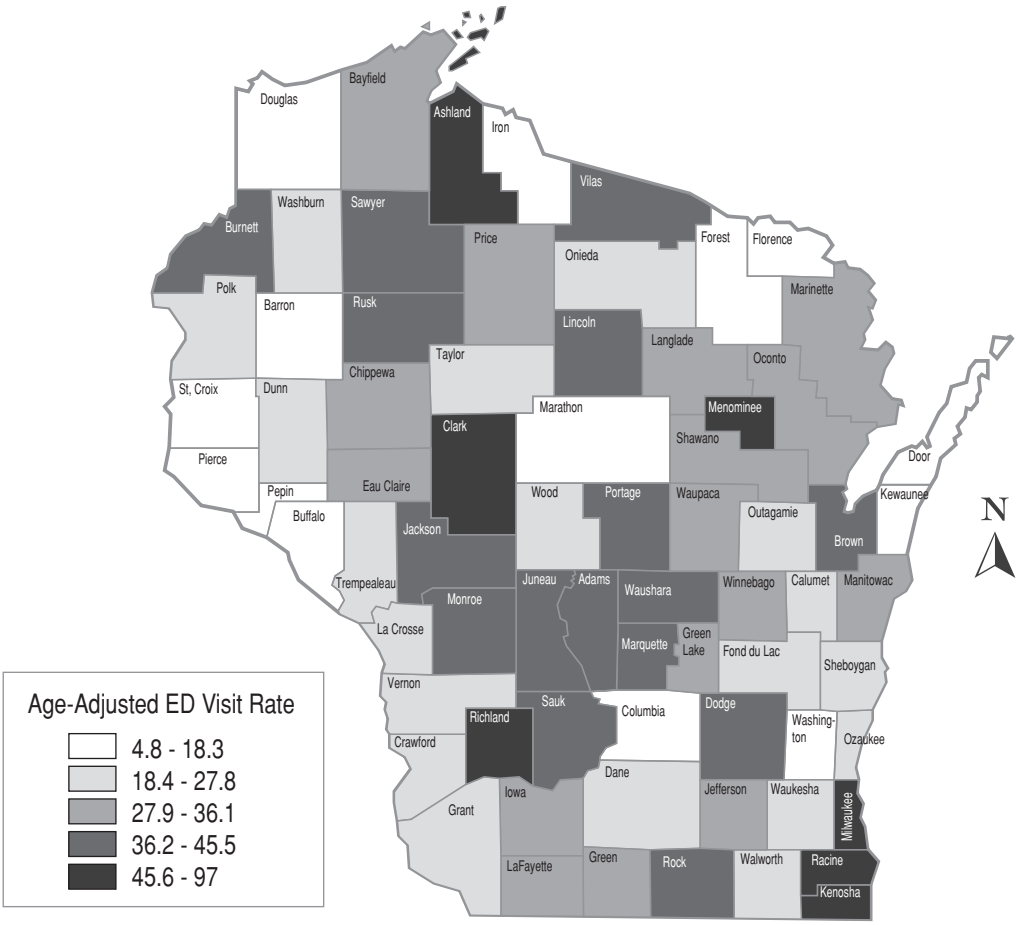
*Asthma listed as either the principal or secondary diagnosis (ICD-9-CM codes 493.00 - 493.92)

Data Source: 2002 Hospital Emergency Department Visit Data, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Age-adjusted asthma hospital ED visit rates by county are mapped in Figure 31. Rates for each county are listed separately in Table 20, Appendix C. Milwaukee County and Menominee County had the highest rates of asthma hospital ED visits in 2002 at 97 and 84 visits per 10,000 respectively.

Figure 31. Age-Adjusted Asthma** Hospital Emergency Department Visit Rates per 10,000 Population by County, Wisconsin, 2002.*

Overall State Rate: 42.0 Asthma Hospital Emergency Department Visits per 10,000 Population



* Age-adjusted to the year 2000 US standard population

** Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00 - 493.92)

Data Source: 2002 Hospital Emergency Department Visit Data, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

How is Health Care for Asthma Utilized in Wisconsin?

Asthma Inpatient Hospitalizations

Inpatient hospitalizations are one of the most serious consequences of asthma both in terms of personal costs to affected individuals and associated medical costs. Asthma hospitalizations are considered to be almost wholly preventable with appropriate asthma treatment and trigger avoidance.

Inpatient hospitalizations represent the largest portion of direct medical expenditures for asthma (Weiss et al., 1992). Asthma hospitalization charges (not including emergency department visits or physician costs) totaled almost $36 million for Wisconsin residents in 2002. The average charges for an asthma hospitalization more than doubled from $3,256 in 1990 to $6,942 in 2002, not accounting for inflation.

Among Wisconsin residents, there were 79,522 hospitalizations with asthma as the principal diagnosis from 1990-2002. On average, 6,119 asthma hospitalizations occurred per year, with the highest number occurring in 1993 when there were 7,115 hospitalizations. Since 1993, there has been a downward trend in asthma hospitalizations with the lowest number occurring in 2002 with 5,181 hospitalizations among Wisconsin residents. See Appendix B for detailed annual hospitalization counts.

The average length of stay for an asthma hospitalization declined from 3.8 days to 3.0 days from 1990 to 2002. Data from 2002 presented in Table 6 show the most recent data on average length of stay, the average charge per hospitalization and total hospitalization charges by sex, race, ethnicity and age group for asthma hospitalizations.

Females were hospitalized an average of 3.4 days as compared to the male average length of stay of 2.4 days per asthma hospitalization in 2002. Adults had longer lengths of stay than children. Older adults, aged 65 years and over, had the longest average hospital stay (5.1 days). In contrast, children aged 0-4 years were hospitalized on average for 2.7 days per asthma hospitalization. Across all age groups, females were hospitalized longer than males (data not shown).

How is Health Care for Asthma Utilized in Wisconsin?

Table 6. Number of Asthma Hospitalizations, Average Length of Stay (LOS), Average Charge per Asthma Hospitalization, and Total Asthma Hospitalization Charges by Sex, Race, Ethnicity and Age, Wisconsin Residents, 2002.*

	Hospitalizations (#)	Average LOS (days)	Average Charge per Hospitalization ($)	Total Hospitalization Charges ($)
Sex				
Male	2,061	2.4	5,659	11,662,429
Female	3,120	3.4	7,791	24,308,201
Race§				
White	3,434	3.1	6,672	22,910,469
African American	1,352	2.8	7,719	10,436,192
Native American	68	2.9	5,563	378,272
Asian	53	3.2	6,510	345,035
Ethnicity				
Hispanic	163	3.1	7,261	1,183,478
Non-Hispanic	4,828	3.0	6,995	33,773,188
Age (years)				
0-4	949	2.3	3,805	3,611,192
5-14	665	2.3	4,476	2,976,834
15-34	736	2.6	6,511	4,792,359
35-64	1,872	3.7	8,022	15,017,156
65+	959	5.1	9,982	9,573,089
Overall Wisconsin Population	**5,181**	**3.0**	**6,943**	**35,970,631**

*Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00 - 493.92)

§Race groups include both Hispanic and non-Hispanic individuals

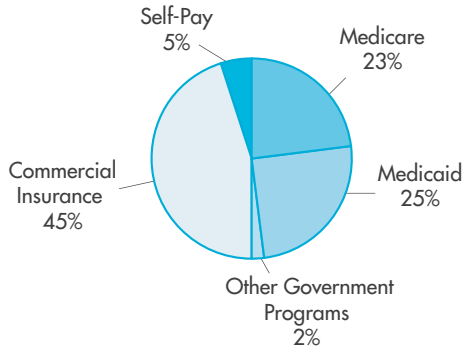
Data Source: 2002 Inpatient Hospital Discharge Data, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

A primary payor is the main source from which hospitals expect to receive payment for hospitalization charges. In Wisconsin, commercial insurance companies were the primary payor for most asthma hospitalizations (45 percent). Medicaid and Medicare were each the primary payor for about 25 percent each of asthma hospitalizations in 2002 (Figure 32).

How is Health Care for Asthma Utilized in Wisconsin?

Asthma Inpatient Hospitalizations

Figure 32. Distribution of the Primary Payor for Asthma Hospitalizations, Wisconsin, 2002.

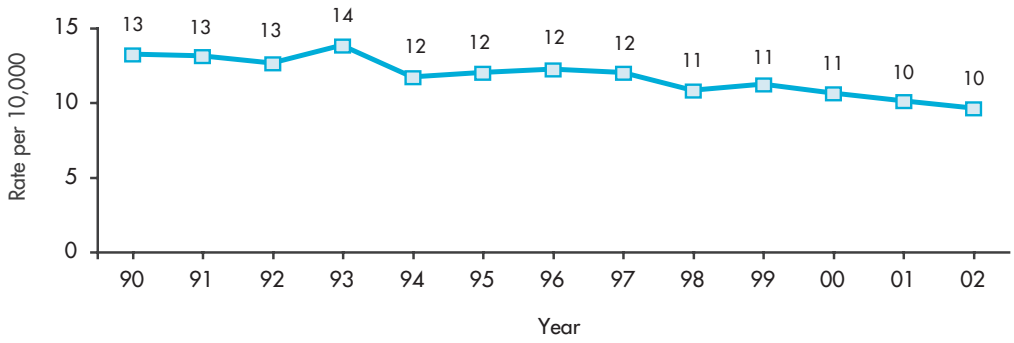


Data Source: 2002 Inpatient Hospital Discharge Data, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Hospitalization Rates

Over the past 10 years, asthma hospitalization rates among Wisconsin residents have slowly declined from a peak in 1993 of 13.8 asthma hospitalizations to 9.6 asthma hospitalizations per 10,000 in 2002 (Figure 33).

Figure 33. Age-Adjusted Asthma** Hospitalization Rates per 10,000, Wisconsin Residents, 1990-2002.*



* Age-adjusted to the year 2000 US standard population

**Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00 - 493.92)

Data Source: 1990-2002 Inpatient Hospital Discharge Data, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

The average asthma hospitalization rate from 1990-2002 was 11.8 per 10,000 Wisconsin residents (Table 7). Children aged 0-4 years had the highest average asthma hospitalization rate– 36.1 asthma hospitalizations per 10,000 from 1990-2002. This rate has declined substantially from the rate of 43.4 per 10,000 in 1993 to 28.0 per 10,000 in 2002. The lowest asthma hospitalization rate is seen among individuals aged 15-34 years.

Table 7. Annual and Average (1990-2002) Age-Specific Asthma Hospitalization Rates** and Total Age-Adjusted Asthma Hospitalization Rates[¥], Wisconsin Residents, 1990-2002.*

	Year													
Age Group (Years)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Average
≤ 4	41.9	38.2	43.4	41.4	33.0	35.6	38.9	39.6	34.6	33.0	31.6	28.9	28.0	36.1
5-14	16.2	17.8	16.3	17.7	13.1	13.3	14.0	17.4	12.3	12.1	13.1	9.6	8.8	14.0
15-34	7.3	7.3	8.0	9.5	8.6	9.3	8.5	8.0	7.0	6.8	6.2	5.7	4.9	7.5
35-64	9.2	9.5	8.5	9.5	8.7	8.9	9.4	8.3	8.4	9.5	8.4	9.1	8.7	8.9
≥65	19.3	18.2	14.7	17.1	14.5	13.2	12.5	11.4	12.3	12.9	13.0	13.5	13.6	14.3
Total[¥]	**13.2**	**13.1**	**12.6**	**13.8**	**11.7**	**12.0**	**12.2**	**12.0**	**10.8**	**11.2**	**10.6**	**10.1**	**9.6**	**11.8**

* Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00 - 493.92)

** All rates are per 10,000 population

¥ Standard 2000 US population used for direct age-adjustment

Data Source: 1990-2002 Inpatient Hospital Discharge Data, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Table 8. Annual and Average (1990-2002) Age-Adjusted Asthma Hospitalization Rates**[¥] by Sex, Race, and Ethnicity, Wisconsin, 1990-2002.*

	Year													
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Average
Sex														
Female	14.1	14.2	13.5	14.9	13.1	13.6	13.7	13.4	12.8	12.8	12.2	11.7	11.1	13.2
Male	12.1	11.9	11.6	12.5	10.1	10.3	10.5	10.5	8.6	9.3	8.9	8.3	7.9	10.2
Race[§]														
White	-	9.5	9.2	10.4	8.4	8.8	8.7	8.6	7.5	7.8	7.4	7.3	7.0	8.4
African American	-	50.5	54.2	55.8	52.7	50.5	54.8	50.3	47.8	49.4	45.7	42.4	42.5	49.6
Asian/ Pacific Islander[Ω]	-	9.7	11.7	9.9	9.6	10.7	8.4	7.7	5.3	7.1	8.8	6.7	7.5	8.4
Native[Ω] American/ Alaskan Native	-	8.5	12.6	12.8	13.4	13.6	11.6	10.6	11.1	8.8	8.8	13.9	13.9	11.7
Ethnicity														
Hispanic	-	-	16.1	18.2	16.8	17.0	16.8	13.9	11.9	12.0	9.2	9.7	11.6	13.4
Non-Hispanic	-	-	11.9	13.4	11.2	11.6	11.8	11.5	10.5	10.2	10.0	9.5	9.3	11.0

*Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00 - 493.92)

**All rates are per 10,000 population

¥Standard 2000 US population used for direct age-adjustment

§Race groups include both Hispanic and non-Hispanic individuals

ΩDue to small numbers, these rates should be interpreted with caution

Data Source: 1990-2002 Inpatient Hospital Discharge Data, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

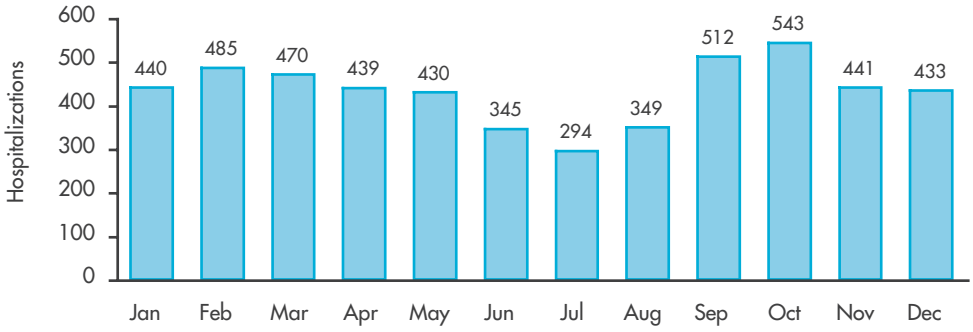
How is Health Care for Asthma Utilized in Wisconsin?

Asthma Inpatient Hospitalizations

Among Wisconsin residents, females were hospitalized at a higher rate than males with an average rate from 1990-2002 of 13.2 versus 10.2 asthma hospitalizations per 10,000 (Table 8). Although hospitalization rates among African Americans have also been decreasing over the past ten years, African Americans continue to be hospitalized at a rate about six times that of the white population. Annual rates among other racial groups are difficult to interpret due to low number of hospitalizations, resulting in fluctuations in rates from year to year. Overall, from 1991-2002, Native Americans and Alaskan Natives were hospitalized at slightly higher rate than whites. Race data was not reported consistently until 1991 and ethnicity data until 1992; therefore, rates for these populations were not calculated for these years.

Similarly to asthma hospital emergency department visits, a peak in asthma hospitalizations is seen around September and October (Figure 34). This peak is generally thought to be due to multiple seasonal factors including increased infections and high pollen and fungal counts.

Figure 34. Asthma Hospitalizations among Wisconsin Residents by Month of Admission, 2002.*



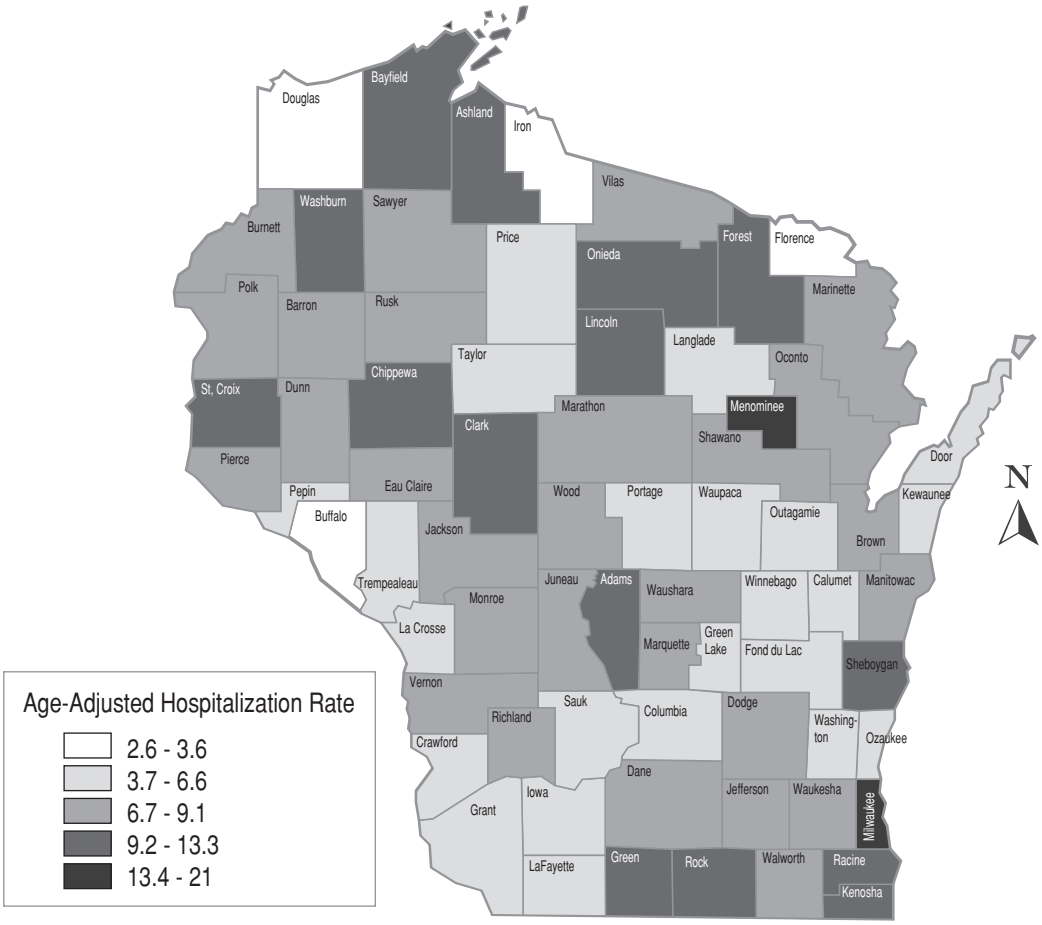
*Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00 - 493.92)

Data Source: 2002 Inpatient Hospital Discharge Data, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Age-adjusted asthma hospitalization rates by county are mapped in Figure 35. Rates for each county are listed separately in Table 20 in Appendix C. Milwaukee County and Menominee County had the highest rates of asthma hospitalizations from 2000-2002 at 21.0 and 16.2 hospitalizations per 10,000 respectively. These counties also had the highest asthma hospital ED visit rates (Figure 31).

Figure 35. Age-Adjusted Asthma** Hospitalization Rates per 10,000 Population by County, Wisconsin, 2000-2002.*

Overall State Rate: 10.1 Asthma Hospitalizations per 10,000 Population



* Age-adjusted to the year 2000 US standard population

** Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00 - 493.92)

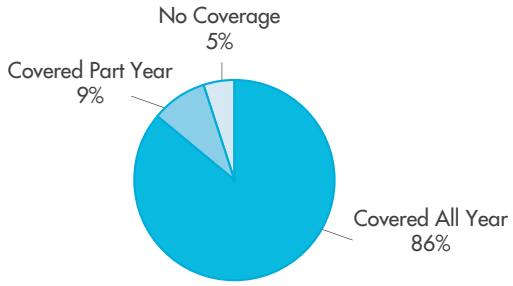
Data Source: 2000-2002 Inpatient Hospital Discharge Data, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

How is Health Care for Asthma Utilized in Wisconsin?

Health Insurance Coverage

Utilization of healthcare can be affected by health insurance coverage. In Wisconsin, from 1997-2000, 5 percent of Wisconsin residents who reported having ever been told that they have asthma had no insurance coverage for the entire year (Figure 36). Nine percent reported insurance coverage for part of the past year (FHS).

Figure 36. Health Insurance Coverage of Wisconsin Residents with Asthma, 1997-2000.



Data Source: 1997-2000 Family Health Survey, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

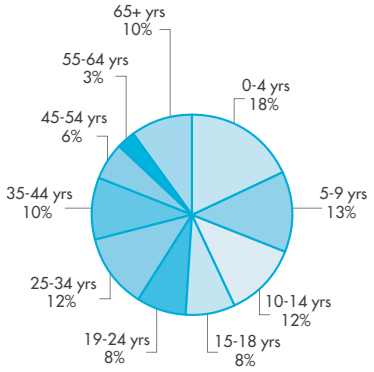
The Medicaid Population

The Medicaid program is a dual state and federal assistance program that provides medical insurance to individuals who meet specific eligibility criteria. These eligibility criteria are a combination of income level and other factors such as falling into a specific age category, having a disability or being pregnant. As of September 2003, there were approximately 750,000 individuals covered by the Wisconsin Medicaid program (Wisconsin Medicaid Caseload web site, accessed October 2003).

The Medicaid program provides insurance coverage for recipients through one of two payment methods–fee-for-service (FFS) or health maintenance organizations (HMOs). FFS is the traditional health care payment system under which physicians and other providers receive a payment for each unit of service provided (Wisconsin Medicaid Update, 2000). HMOs are health care plans that provide comprehensive health services to enrolled members for a fixed, period payment ("capitation rate") (Carabell and Menga, 2001). If enrollees either use more or more costly services than anticipated, the HMO may incur a financial loss. The populations utilizing these different types of coverage vary by geographic region and by degree of morbidity. For all Medicaid analyses in this report, recipients from both types of payment programs have been pooled together.

Due to Medicaid eligibility criteria, the age distribution of the Wisconsin Medicaid population is not representative of the Wisconsin population overall. The Wisconsin Medicaid population is skewed towards younger ages with approximately 50 percent of recipients in 2002 under 18 years of age. The age distribution of Medicaid recipients in 2002 is shown in Figure 37.

Figure 37. Distribution of Medicaid Recipients by Age, Wisconsin, 2002.



Data Source: Division of Health Care Financing, Wisconsin Department of Health and Family Services

How is Health Care for Asthma Utilized in Wisconsin?

The Medicaid Population

As the Medicaid program pays for health care of recipients, detailed information on procedures, ambulatory visits, hospitalizations and prescription medication usage is maintained by the program for the purpose of reimbursement. Data gathered by the Medicaid program provide valuable insight into the care of individuals with asthma in a specialized, generally lower income, subset of the Wisconsin population. As reported previously in this report (see Figure 32), the Medicaid program was the primary payor for 25 percent of asthma hospitalizations in 2002. Although findings among the Medicaid population may not be generalizable to the rest of the Wisconsin population, they do allow us to understand the experience of a high-risk population with asthma. Data in this report are for Medicaid recipients for the years 2000 to 2002.

Appropriate Medication Usage

The Health Plan Employer Data and Information Set (HEDIS) is a set of standardized performance measures designed to enable purchasers and consumers to compare the performance of managed health care plans. HEDIS is sponsored, supported and maintained by the National Committee for Quality Assurance (NCQA) (NCQA web site, October 2003).

A HEDIS performance measure has been developed to look at appropriate medications for people with persistent asthma to evaluate if health care plan members are prescribed medications acceptable as primary therapy for long-term control of their asthma. The performance measure defines appropriate medication usage as at least one dispensed prescription of the following four classes of drugs given to a member with persistent asthma:

- Inhaled corticosteroids
- Cromolyn sodium and nedocromil
- Leukotriene modifiers
- Methylxanthines

The measure is applied to health plan members aged 5-56 years who have persistent asthma, as defined by meeting any one of the following four criteria:

- At least four asthma medication dispensing events
- At least one emergency department visit with asthma as the principal diagnosis
- At least one acute inpatient discharge with asthma as the principal diagnosis
- At least four outpatient asthma visits based for asthma as one of the listed diagnoses and at least two asthma medication dispensing events

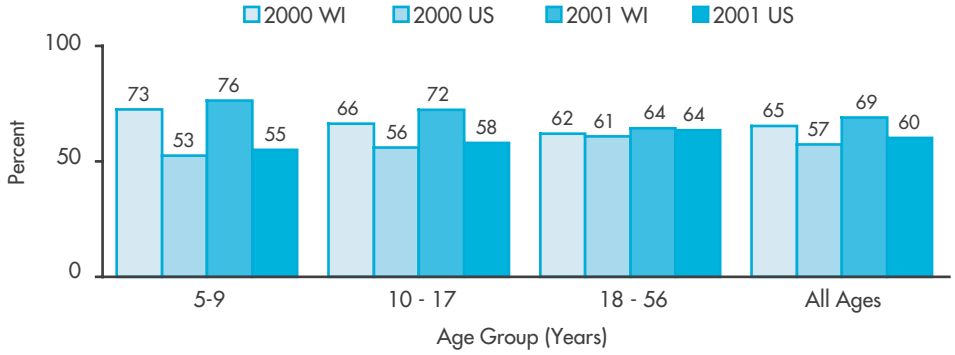
How is Health Care for Asthma Utilized in Wisconsin?

To examine asthma medication prescription practices, the HEDIS asthma appropriate medication performance measure was calculated for the Medicaid population for the years 2000 and 2001. The HEDIS performance measure allows no more than a 45-day gap in eligibility, so to be included in these analyses, recipients had to be enrolled in Medicaid at least 320 days in the year of measurement. Although HEDIS calls for continuous recipient eligibility in the health plan in the year prior to the performance measurement year, to calculate this performance measure, this condition was modified slightly in these analyses to account for the fluidity of coverage of the Medicaid population. These analyses, instead, based the criteria of continuous Medicaid eligibility and persistent asthma, on the same year as the measurement year to get a more representative sample of the Medicaid population.

Overall, 65.3 percent and 68.9 percent of Wisconsin Medicaid recipients with persistent asthma aged 5-56 years received appropriate primary therapy for long-term control of asthma in 2000 and 2001, respectively (Figure 38). In both years, children aged 5-9 years of age were more likely to receive appropriate medications than other age groups. Improvement was seen for all age groups from 2000 to 2001.

Wisconsin Medicaid recipients appear to have had a higher rate of appropriate asthma medication prescription than the national Medicaid average (NCQA, 2003). Results are not directly comparable due to the slightly modified criteria for determining recipients.

Figure 38. Modified HEDIS Measure: Use of Appropriate Medications for People with Persistent Asthma by Age, Wisconsin and US Medicaid Recipients, 2000-2001.



Data Source: 2000-2001 Division of Health Care Financing, Wisconsin Department of Health and Family Services and the National Committee for Quality Assurance

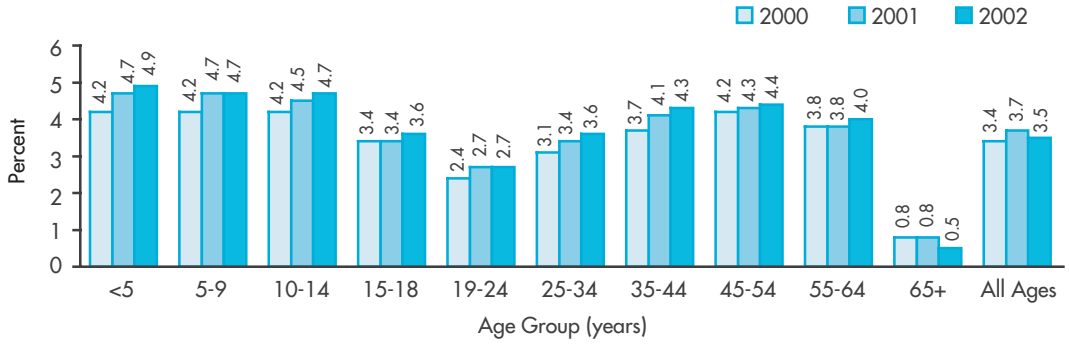
How is Health Care for Asthma Utilized in Wisconsin?

The Medicaid Population

Ambulatory Visits

Ambulatory visits are health care visits provided on an outpatient basis; that is, where individuals are not confined to a hospital or treatment center for their care. Overall, about 4 percent of Medicaid recipients had ambulatory visits for asthma from 2000 to 2002 (Figure 39). The oldest age group, adults sixty-five years and older, had the lowest ambulatory visit rate with less than 1 percent of Medicaid recipients in this age group having an ambulatory visit for asthma. This is likely due to coverage of the asthma ambulatory visits in this age group by the Medicare program. The ambulatory visit rates for males and females were almost identical (data not shown).

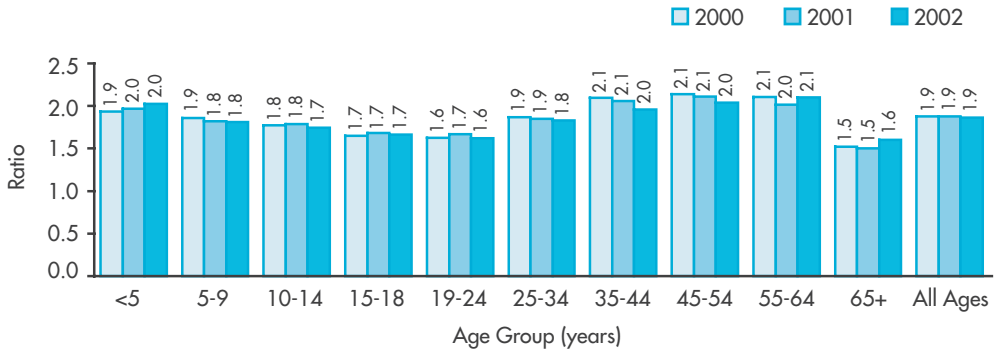
Figure 39. Annual Ambulatory Visit Rate by Age Group among Medicaid Recipients, Wisconsin, 2000-2002.



Data Source: 2000-2002 Division of Health Care Financing, Wisconsin Department of Health and Family Services

Medicaid recipients with ambulatory visits for asthma had on average 1.9 visits with asthma as either as the principal or secondary diagnosis in 2000, 2001 and 2002. When examined by age group, adults aged 35-64 had a slightly higher visit per recipient ratio than younger age groups. Ambulatory visit ratios remained stable across age groups from 2000-2002. When examined by sex, the visit rates were almost identical (data not shown).

Figure 40. Ambulatory Visits per Medicaid Recipient Ratio by Year and Age Group, Wisconsin, 2000-2002.

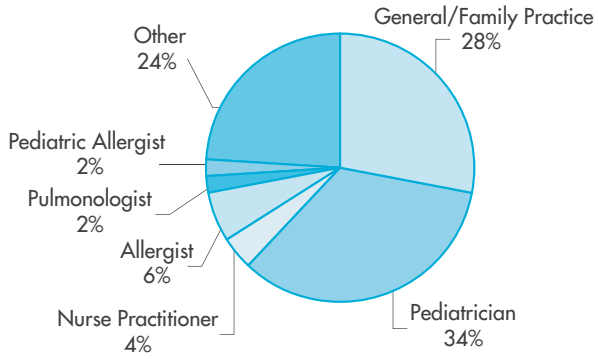


Data Source: 2000-2002 Division of Health Care Financing, Wisconsin Department of Health and Family Services

How is Health Care for Asthma Utilized in Wisconsin?

Ambulatory visits for Medicaid recipients from 2000 to 2002 were analyzed to determine the types of providers providing ambulatory asthma care for Medicaid recipients. Provider usage remained similar from 2000 to 2002. Data from 2002 is presented in Figure 41.

Figure 41. Distribution of Ambulatory Visits by Provider Type among Medicaid Recipients, Wisconsin, 2002.



Data Source: 2002 Division of Health Care Financing, Wisconsin Department of Health and Family Services

Pediatricians were the provider type most often seen by Medicaid recipients for asthma outpatient care. This is likely a reflection of the young age structure of the Medicaid population. General/family practice physicians were the second largest provider group seen for asthma outpatient visits. The 'other' group, made up primarily of the following specialties: Internal Medicine (49 percent), Clinic/outpatient (21 percent), Physician Assistant (10 percent), Urgent Care (7 percent), and Neurology (2 percent), constituted 24 percent of ambulatory visits. Specialists such as pulmonologists and allergists made up only a small portion of the care provided on an outpatient basis to Medicaid recipients. The NAEPP Guidelines for Diagnosis and Management of Asthma (NHLBI, 1997) have specific recommendations for referral to specialists. In general, specialist care is recommended only for more severe asthma cases. Utilization of generalists for the majority of asthma care highlights the need for training of these physicians in order to provide appropriate asthma management and treatment.

Emergency Department Visits

Overall, about 1 percent of Medicaid recipients had emergency department visits for asthma from 2000 to 2002 with an average of 1.4 asthma emergency department visits per recipient. Of Medicaid recipients with any emergency department visits from 2000 through 2002, about 3.2 percent had an asthma-related emergency department visit (data not shown).

Who Has Died of Asthma in Wisconsin?

Deaths due to asthma are rare and preventable. Across the nation, about 5,000 deaths from asthma occur annually (Mannino et al., 2002). In Wisconsin, there are on average 100 asthma deaths per year (see Table 19, Appendix B for annual asthma death counts).

Mortality

Mortality data available from the Vital Records Office, Bureau of Health Information, Wisconsin Department of Health and Family Services were used to calculate asthma mortality rates.

Table 9. Annual and Average (1990-2001) Age-Specific Asthma Mortality Rates** and Total Age-Adjusted Asthma Mortality Rates¥, Wisconsin Residents, 1990-2001.*

	Year												
Age Group (Years)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average
≤ 4	5.5§	0	0	0	5.8§	0	3.0§	0	0	10.0§	0	0	2.0
5-14	4.1§	1.3§	3.9§	3.9§	1.3§	5.1§	5.1§	1.3§	2.5§	2.8§	2.9§	4.4§	3.2
15-34	5.9	5.9	2.0§	2.7§	3.3	5.3	8.0	4.0	4.1	3.8	6.8	3.8	4.6
35-64	16.7	14.4	9.3	15.2	13.2	19.2	19.2	8.7	11.0	13.7	12.4	10.6	13.6
≥65	99.6	104.3	83.5	97.1	121.1	73.5	101.8	100.0	89.8	79.8	85.9	60.3	91.4
Total¥	**21.3**	**20.3**	**15.1**	**19.2**	**21.6**	**18.7**	**23.2**	**17.0**	**16.9**	**17.3**	**17.7**	**13.2**	**18.5**

* Asthma listed as the underlying cause of death (ICD-9 codes 493.0 – 493.9 and ICD-10 codes J45 and J46)

** All rates are per 1,000,000 population

¥ Standard 2000 US population used for direct age-adjustment

§ Rates based on small number of deaths (n<5) and should be interpreted with caution

Data Source: 1990-2001 Vital Records Office, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

The average Wisconsin asthma mortality rate was 18.5 deaths per million from 1990 to 2001 (Table 9). Deaths from asthma appear to have been decreasing over the past twelve years with mortality rates declining from 21.3 asthma deaths per million in 1990 to 13.2 deaths per million in 2001. As less than 100 asthma deaths occur on average in Wisconsin per year, annual rates are quite variable and annual comparisons should be made with caution.

Adults aged sixty-five and older had the highest mortality rate over this period of time at 91.4 deaths per million, similarly to national data (Mannino et al., 2002). In Wisconsin, this age group has experienced a decline in annual asthma mortality rates over the past five years. This decrease may be due to a real decrease in the number of asthma deaths but could also be attributed to changes in diagnostic and coding practices over time (Pearce et al, 1998).

Table 10. Annual and Average (1990-2001) Age-Adjusted Asthma Mortality Rates**¥ by Sex and Race, Wisconsin, 1990-2001.*

	Year												
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Average
Sex													
Female	25.6	19.7	16.6	20.1	24.2	18.9	22.3	19.4	17.8	19.6	20.0	16.8	20.1
Male	16.6	20.6	13.3	17.9	18.0	18.1	23.7	14.2	15.6	14.4	14.7	8.8	16.3
Race†													
White	19.2	20.0	14.0	17.4	19.2	16.5	19.6	15.4	15.6	14.9	14.3	12.3	16.5
African American	80.5	23.3§	51.6	59.7	73.4	49.8	99.8	49.0	38.0	71.1	102.9	39.2	61.5
Other	0	35.8§	0	14.0§	107.0§	25.1§	0	37.9§	25.4§	11.3§	0	9.6§	22.2
Total¥	**21.3**	**20.3**	**15.1**	**19.2**	**21.6**	**18.7**	**23.2**	**17.0**	**16.9**	**17.3**	**17.7**	**13.2**	**18.5**

* Asthma listed as the underlying cause of death (ICD-9 codes 493.0 – 493.9 and ICD-10 codes J45 and J46)

** All rates are per 1,000,000 population

¥ Standard 2000 US population used for direct age-adjustment

† Race groups include both Hispanic and non-Hispanic individuals

§ Rates based on small number of deaths (n<5) and should be interpreted with caution

Data Source: 1990-2001 Vital Records Office, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Asthma mortality rates are higher in females than males reflecting the gender differences seen in Wisconsin asthma prevalence, asthma hospital ED visits, and asthma hospitalizations (Table 10). The average mortality rate for females was 20.1 versus 16.3 deaths per million in males (1990-2001). Among racial groups, African Americans had an average asthma mortality rate almost four times higher than the average rate in the white population at 61.5 deaths per million from 1990 to 2001.

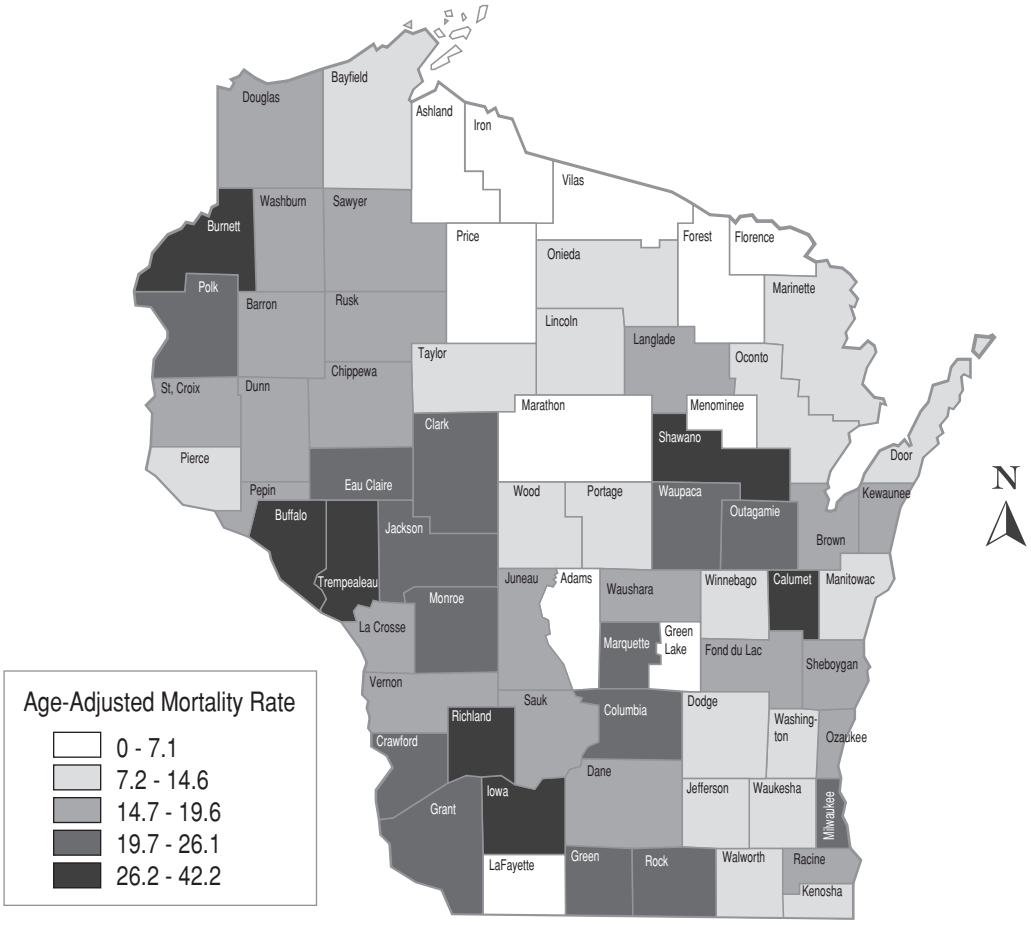
County-specific age-adjusted asthma mortality rates, based on all asthma deaths from 1990-2001, are mapped in Figure 42. From 1990-2001, Buffalo County had the highest mortality rate with 42.2 asthma deaths per million population. Milwaukee County had the 18th highest rank of county asthma mortality rates despite having had the highest rate of asthma hospital ED visits (2002) and asthma hospitalizations (2000-2002). Menominee County, which had the second highest rate of asthma hospital ED visits and asthma hospitalizations, had no asthma deaths from 1990 to 2001. For county-specific mortality rates, see Table 20 in Appendix C.

Who Has Died of Asthma in Wisconsin?

Mortality

Figure 42. Age-Adjusted Asthma** Mortality Rates per Million Population by County, Wisconsin, 1990-2001.*

Overall State Rate: 18.5 Asthma Deaths per Million Population



* Age-adjusted to the year 2000 US standard population

** Asthma listed as the underlying cause of death (ICD-9 codes 493.0 – 493.9 and ICD-10 codes J45 and J46)

Data Source: 1990-2001 Vital Records Office, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Which Populations Are Especially Affected By Asthma?

Some segments of the population are more severely affected by asthma. In this section, data highlighting some of these groups–diverse populations, residents of urban areas and workers–are presented.

Diverse Populations

In Wisconsin, the prevalence of asthma is higher among certain racial and ethnic populations. As shown in Figure 4, current asthma prevalence among non-Hispanic African American adults was 15 percent as compared to 8 percent among non-Hispanic whites (BRFS, 2001-2002). Although hospitalization rates among African Americans have been decreasing over the past eight years, African Americans continue to be hospitalized at a rate about six times that of the white population (see Table 8). Higher asthma prevalence rates among African Americans do not entirely explain the higher rate of asthma hospitalizations. Asthma mortality rates reveal a similar racial disparity. The asthma mortality rate among African Americans is four-fold the rate of the white population (see Table 10).

Current asthma prevalence among Wisconsin non-Hispanic American Indians (13 percent), is also higher than the prevalence among non-Hispanic whites (BRFS, 2001-2002). The hospitalization rate for Native Americans is slightly higher than for the white population (see Table 8). Menominee County, which was created in 1961 from the Menominee Indian Reservation, had the second highest rates of hospital ED visits and inpatient hospitalizations for asthma in the state, after Milwaukee County. Mortality rates among non-Hispanic Native Americans could not be calculated because of the small number of deaths.

Current asthma prevalence among the Hispanic population is similar to the rate in the non-Hispanic white population at 9 percent (BRFS, 2001-2002). However, lifetime asthma prevalence appears to be have been increasing in this population over the past 12 years (FHS, 1989-2000). The asthma hospitalization rate is slightly higher in Hispanics than in non-Hispanics (see Table 8).

To show how Wisconsin compares to the US, race-specific hospitalization and mortality rates are presented in Table 11 (national data were not available for the Hispanic and Native American populations). Nationally, African Americans have elevated asthma hospitalization and mortality rates as compared to whites. The disparity between African Americans and whites in Wisconsin is larger than at the national level for both asthma hospitalization and mortality rates.

Table 11. Wisconsin and US Age-Adjusted** Asthma Mortality and Hospitalization Rates by Race, 1999.*

	Wisconsin Hospitalization Rate 1999 (per 10,000)	US Hospitalization Rate 1999 (per 10,000)	Wisconsin Mortality Rate 1999 (per million)	US Mortality Rate 1999 (per million)
Race				
White	8.1	10.6	14.9	14.2
African American	49.7	35.6	71.1	38.7
Other***	22.8	31.5	11.3	20.4

*Mannino et al., 2002
**Age-adjusted to the year 2000 US standard population
***Rates are based on small numbers and should be interpreted with caution

Which Populations Are Especially Affected by Asthma?

Urban Areas

Some studies have shown that individuals living in urban areas have a heightened risk of asthma (Aligne et al., 2000). According to the 2000 US census, 99.7 percent of Milwaukee County residents live in urbanized areas, qualifying it as the most urban county in the state (Wisconsin Department of Administration, 2002). In Wisconsin, Milwaukee County had both the highest rate of asthma inpatient hospitalizations from 2000 to 2002 and the highest rate of asthma hospital emergency department visits in 2002.

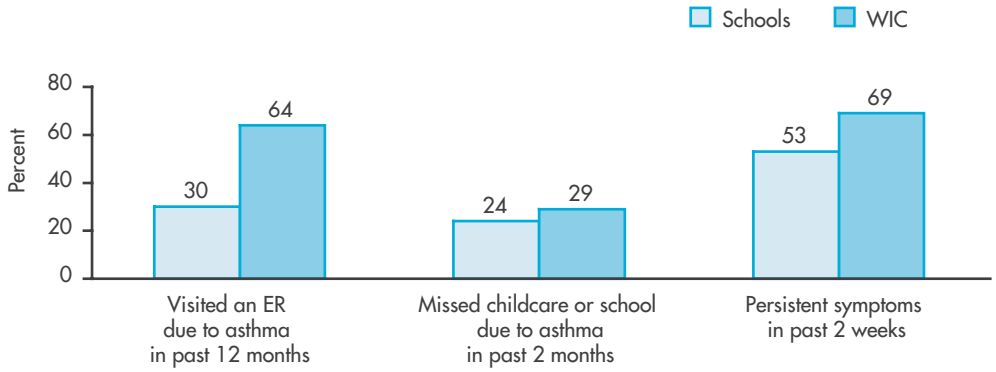
Fight Asthma Milwaukee Allies (FAM-Allies) is a community-based asthma coalition working towards improving the quality of life of children with asthma and their families in Milwaukee. FAM-Allies has been in existence since 1994 and in 2002 received a Robert Wood Johnson Foundation award to continue and expand their work. Among the coalition's many activities is conducting asthma surveillance in the Milwaukee area, which is done with financial support from the DHFS.

To assess asthma prevalence, severity, and quality of life among urban children in Milwaukee, in 2002, FAM-Allies administered a cross-sectional survey in grades three to five in two elementary schools where greater than 90 percent of students receive reduced lunches and the school neighborhoods had more than 3 asthma hospitalizations per 1,000 children. The survey was also administered at an urban Women, Infants and Children (WIC) clinic site to parents of children aged 12-47 months to identify children with possible asthma. Caregivers of children with asthma and school-aged children received a follow-up survey to assess quality of life. A pediatric-specific survey was given to the children. The data collected via these surveys characterize the experience of children with asthma in the most urban area of Wisconsin.

Twenty-six percent of the elementary school children and 41 percent of the WIC children had ever been diagnosed with asthma by a doctor, according to their caregivers (data not shown). When these estimates were corrected for response bias, that is, taking into account that not all distributed surveys were returned and that caregivers of children with asthma were more likely to return the survey, 14 percent and 27 percent of children respectively were estimated to have ever been diagnosed with asthma in these urban settings. These estimates are much higher than statewide estimates of asthma prevalence for children.

According to parents who returned the follow-up quality of life questionnaire, several of the children with asthma had severe outcomes associated with their asthma. Sixty-four percent of children with asthma surveyed through the WIC clinics were taken to the emergency department in the past 12 months due to their asthma and 69 percent of children had persistent asthma symptoms in the past two weeks (Figure 43). These rates were lower in school-aged children, although, rates for both groups were higher than seen at the state-level.

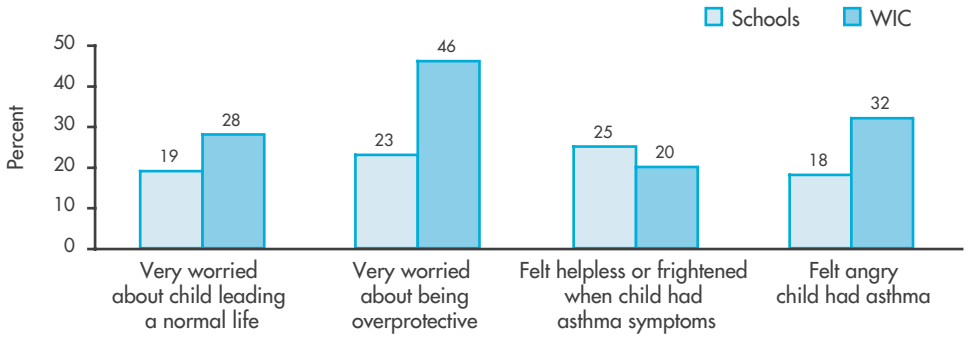
Figure 43. Asthma among Milwaukee Urban Children at Selected Survey Sites, 2002.



Data Source: Meurer et al., Medical College of Wisconsin and Fight Asthma Milwaukee Allies

Asthma has a detrimental effect on the quality of life of both people with asthma and their caregivers. As reported on the follow-up survey, several parents had negative emotions concerning their children's asthma. Parents were worried about their child leading a normal life and worried that they were overprotective of their children. They also often felt helpless or frightened when their child had symptoms and angry that their child had asthma.

Figure 44. Effects of Children's Asthma on Caregivers Quality of Life at Selected Survey Sites, Milwaukee, 2002.



Data Source: Meurer et al., Medical College of Wisconsin and Fight Asthma Milwaukee Allies

In the most urban part of the state, in one of the areas most highly impacted by asthma, these data show that asthma takes a heavy toll both on quality of life of those with asthma and their caregivers and involves extensive utilization of the healthcare system.

Which Populations Are Especially Affected by Asthma?

Work-Related Asthma

Several occupational exposures have been implicated in leading to the development or exacerbation of asthma (Chan-Yeung, 1995). Studies conducted in the United States indicate that anywhere from three to twenty-six percent of incident cases of asthma among adults are attributable to exposures in the workplace (Henneberger et al, 2002).

Work-related asthma is diagnosed when an individual has a health professional's diagnosis that is consistent with asthma and there is an association between symptoms of asthma and work (Jajosky et al., 1999). Quantifying the prevalence of work-related asthma has been a challenge historically due to the fact that 1) asthma is a multifactorial disease that is strongly associated with non-occupational exposures and 2) it is difficult to establish occupational dose-response and temporal relationships (American Thoracic Society, 2003). To quantify the prevalence of work-related asthma in Wisconsin, several approaches have been explored.

The first approach was to review the primary payor code for inpatient asthma hospitalizations to determine how many asthma hospitalizations were paid for by worker's compensation with the supposition that if worker's compensation was paying for the hospitalization, it represents a potential case of work-related asthma. Worker's compensation is a form of insurance that covers employees who are injured or become ill because of their work. The program provides for health costs related to work-related injuries or illnesses, as well as lost wages. Results from 1990 to 2002 asthma hospitalization data are summarized below in Table 12.

Very few asthma hospitalizations and, in general, few respiratory illness-related hospitalizations were paid for by worker's compensation. Out of 59,465 hospitalizations paid for by worker's compensation from 1990-2002, only 88 were for hospitalizations with asthma as the principal diagnosis.

Table 12. Respiratory-Related Hospitalizations with Worker's Compensation Identified as the Primary Payor, Wisconsin, 1990-2002.

Principal Diagnosis*	88
Possible Asthma**	1,510
Other Respiratory Diseases***	603
Total	**59,465**

* Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00 - 493.92)

** Possible asthma: Secondary diagnosis coded as asthma and principal diagnosis coded as acute/chronic bronchitis (includes ICD-9-CM codes 493.00 - 493.92, 491.20 and 491.21)

*** The other respiratory diseases category includes: emphysema, extrinsic allergic alveolitis, chronic airway obstruction, respiratory conditions due to other/unspecified external agents, other acute/subacute and unspecified respiratory conditions due to fumes/vapors, and symptoms involving respiratory system/other chest symptoms (includes ICD-9-CM codes 492.0, 495.0, 496.0, 508.0, 506.3, 506.9, and 786.0)

Data Source: 1990-2002 Inpatient Hospital Discharge Data, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Which Populations Are Especially Affected by Asthma?

The Wisconsin Department of Workforce Development (DWD) administers the state's worker's compensation program. Data on all claims related to respiratory diseases were obtained from the DWD to examine total asthma-related worker's compensation claims from 1998-2002. As these data demonstrate (Table 13), few workers in Wisconsin file claims for worker's compensation due to asthma or other respiratory diseases.

Table 13. Annual Number of Respiratory-Related Worker's Compensation Claims, Wisconsin, 1998-2002.

	Year				
	1998	1999	2000	2001	2002
Disease Category					
Asthma	43	45	31	27	16
Bronchitis	3	7	5	6	4
Other Respiratory Diseases*	102	119	58	52	47
Asbestosis	15	8	14	8	8
Pneumoconiosis	2	0	0	1	0
Silicosis	1	3	5	4	2
Latex	9	5	1	1	0
Total Claims in Wisconsin	**48,047**	**58,620**	**52,868**	**46,633**	**41,360**

* This category includes ICD-9-CM codes: 492 (emphysema), 495 (extrinsic allergic alveolitis), 496 (chronic airway obstruction, not elsewhere classified), 508 (respiratory conditions due to other/unspecified external agents), 506.3 (other acute/subacute respiratory conditions due to fumes/vapors), 506.9 (unspecified respiratory conditions due to fumes and vapors), and 786.0 (symptoms involving respiratory system/other chest symptoms)

Data Source: 1998-2002 Wisconsin Department of Workforce Development

The prevalence of work-related asthma is thought to be much higher than the existing data sources suggest. The Wisconsin Asthma Program has partnered with the Bureau of Occupational Health, both within the Wisconsin Department of Health and Family Services, to create a survey that will be distributed throughout the state, to better quantify the occurrence of work-related asthma. Data from this survey will be presented in future publications. In addition, four work-related asthma questions were added to the 2003 Wisconsin Behavioral Risk Factor Survey that will allow better measurement of the prevalence of work-related asthma in Wisconsin.

How Does Wisconsin Compare to the US and The Healthy People 2010 Goals?

The national health plan, *Healthy People 2010*, has identified eight goals related to asthma. To show how Wisconsin is doing relative to these goals and to the rest of the country, data addressing three key *Healthy People 2010* asthma goals are presented in the following tables. Wisconsin rates were calculated to match the national rates reported in the Healthy People 2010 publication by year and age group. When available, more recent data were used to calculate rates to show Wisconsin's progress towards reaching the *Healthy People 2010* goals. All Wisconsin data presented are from the Bureau of Health Information, Division of Health Care Financing. National data, unless otherwise cited, are from the Healthy People 2010 publication (US Department of Health and Human Services, 2000).

Healthy People 2010 Goal: Reduce Hospitalizations for Asthma

Asthma hospitalization rates were lower in Wisconsin than the national baseline rates reported in the Healthy People 2010 publication for all age groups from 1996-1998 (Table 14). Hospitalization rates in Wisconsin decreased from 1996-1998 to 2000–2002 in children less than four years of age and in the 5-64 year age group. Among adults sixty-five years and older, there was a slight increase in the rate of asthma hospitalizations in this time period. Although Wisconsin asthma hospitalization rates have not yet met the target *Healthy People 2010* goals set for children less than four years of age and adults sixty-five years and older, the decrease in the overall hospitalization rates from 1996-1998 to 2000-2002 is promising.

Table 14. Wisconsin, US, and Healthy People 2010 Target Asthma Hospitalization Rates, 1996-2002.

	Wisconsin Baseline 1996-1998 (per 10,000)**	**US Baseline 1998 (per 10,000)**	**Wisconsin 2000-2002 (per 10,000)**	**Healthy People 2010 Target*** (per 10,000)**
Age Group (years)				
≤ 4	38.0	45.6	29.5	25.0
5-64*	9.7	12.5	7.4	7.7
≥65*	12.6	17.7	13.3	11.0

* Age-adjusted to the year 2000 US standard population

** Fiore et al., 2000

*** US Department of Health and Human Services, 2000

How Does Wisconsin Compare to the US and The Healthy People 2010 Goals?

Healthy People Goal: Reduce Hospital Emergency Department Visits for Asthma

In 2002, the only year for which Wisconsin data are available, asthma hospital emergency department visit rates among Wisconsin residents were lower than national rates from 1995-1997 and 1999 (Table 15). Wisconsin met the *Healthy People 2010* target hospital ED visits rates for people five years of age or older. In children four and younger, Wisconsin asthma hospital ED rates have not yet met the *Healthy People 2010* target.

Table 15. Wisconsin, US and Healthy People 2010 Target Asthma Hospital Emergency Department Visit Rates, 1996-2002.

	Wisconsin Baseline 2002 (per 10,000)	US Baseline 1995-1997 (per 10,000)	US Rates** 1999 (per 10,000)	Healthy People 2010 Target*** (per 10,000)
Age Group (years)				
≤ 4	91.4	150.0	141.8	80.0
5-64*	42.1	71.1	Not available	50.0
≥65*	14.3	29.5	35.5	15.0

* Age-adjusted to the year 2000 US standard population

** Mannino et al., 2002

*** US Department of Health and Human Services, 2000

Healthy People 2010 Goal: Reduce Asthma Deaths

Mortality data from 1996-1998 indicate that Wisconsin had a lower asthma mortality rate than the US in most age groups. Adults 65 years and older in Wisconsin had a higher asthma mortality rate than the national rate in this time period. From 1996-1998 to 1999-2001, the asthma mortality rate in adults 65 years and older declined from 97.2 to 75.3 deaths per million. Wisconsin asthma mortality rates for all age groups from 1999-2001 did not achieve the target *Healthy People 2010* goals.

Table 16. Wisconsin, US and Healthy People 2010 Target Asthma Mortality Rates, 1996-1998.

	Wisconsin Baseline 1996-1998 (per million)	US Baseline 1998 (per million)	Wisconsin 1999-2001* (per million)	Healthy People 2010 Target** (per million)
Age Group (years)				
≤ 4	1.0	2.1	3.3	1.0
5-14	3.0	3.3	3.4	1.0
15-34	5.4	5.0	4.8	2.0
35-64	13.0	17.8	12.2	9.0
≥65	97.2	86.3	75.3	60.0

* A coding comparability ratio was used to adjust these mortality rates based on death certificates coded with ICD-10 to be comparable to mortality rates from Healthy People 2010 which used ICD-9 codes.

** US Department of Health and Human Services, 2000

Conclusions

In Wisconsin, as demonstrated by declining asthma mortality and hospitalization rates, the burden of asthma appears to be lessening slightly. Despite these improvements, asthma continues to affect a large proportion of the population. Approximately 9 percent of adults and 6 percent of children currently have asthma and, about 12 percent of adults and 8 percent of children have ever been diagnosed with asthma (BRFS, 2002).

Although asthma affects all portions of the Wisconsin population, certain subgroups appear to be disproportionately affected by asthma. Children aged 0-4 years, especially male children in this age group; females after puberty; the African American and Native American populations; as well as individuals living in urban areas, appear to be most severely affected by asthma in Wisconsin.

Children aged 0-4 years have the highest asthma hospital ED visit and inpatient hospitalization rates among all age groups. Male children in this age group have higher rates of asthma prevalence and health care utilization for asthma than females. The highest lifetime asthma prevalence is found in children aged 11-17 years (FHS, 1989-2000). Middle school and high school children self-report higher rates of diagnosis with asthma than when adults report on children's asthma (YTS and YRBS, 2003). Children have the lowest asthma mortality rates despite the high asthma prevalence and severity in this age group.

Females, after puberty, have a higher rate of asthma prevalence than males, with females who are classified as obese (BMI≥30), having higher prevalence than non-obese females. Among Wisconsin adults with current asthma, a greater proportion of females (45 percent) reported an asthma attack in the past 12 months than males (39 percent) (BRFS, 2002). Females, after puberty, have higher asthma hospital ED visit, hospitalization and mortality rates than males.

Asthma disparities continue to be an issue in Wisconsin, with the African American and Native American populations most severely affected by asthma. African American adults have the highest current asthma prevalence at 15 percent and Native Americans adults have a rate of 13 percent compared to the current adult asthma prevalence of 8 percent in the non-Hispanic white population (BRFS, 2001-2002). African Americans are hospitalized at about six times the rate of the white population and have a four-fold higher asthma mortality rate. Menominee County, which is predominately Native American, has the second highest countywide rates of asthma hospital emergency department visits and asthma inpatient hospitalizations in Wisconsin.

In addition to these racial groups, poorer households and urban populations appear to be disproportionately affected by asthma. Asthma prevalence is higher in households that are at or below the federal poverty level (FHS, 1997-2000). Milwaukee County, the most urbanized county in the state, has the highest rate of asthma hospital emergency department visits and asthma inpatient hospitalizations.

Conclusions

Among Wisconsin adults with current asthma, it appears that asthma management is lower than optimal. Of adults with current asthma, 80 percent reported experiencing asthma symptoms in the past 30 days, 18 percent reported at least one day in the past 12 months when they were unable to carry out normal activities because of their asthma, and 14 percent reported having at least one emergency department visit for asthma in the past 12 months (BRFS, 2002). Only 48 percent of adults with current asthma reported having a routine checkup for asthma in the past 12 months and only 40 percent reported daily asthma medication usage. Asthma management among adults in Wisconsin needs to improve to be in accordance with the NAEPP guidelines (NHLBI, 1997 and 2002).

Asthma hospitalizations, often the result of poor asthma management, are expensive both in terms of personal and financial costs. The average length of stay for an asthma hospitalization in 2002 was 3.0 days with average charges of almost $7,000. Charges for asthma hospitalizations among Wisconsin residents totaled almost $36 million in 2002. Although Wisconsin asthma hospitalization rates have declined over the past 3 years, hospitalization rates do not yet meet the federal *Healthy People 2010* target rates for most age groups.

Controlling exposure to asthma triggers is an important part of asthma management. The majority of Wisconsin public middle school children (54 percent) reported spending time in the past 7 days in the same room with someone who smoked. Among middle school children who had an asthma attack in the past 12 months, this rate was 70 percent (YTS, 2003). Based on these data, it is clear that avoidance of asthma triggers such as environmental tobacco smoke is not optimal and could use improvement.

While most elementary school principals are familiar with the Wisconsin inhaler law, 26 percent of principals responding to the Elementary School Asthma Survey were not sure of this law. Few elementary schools have full-time nurses and only about half of schools provide asthma training for staff. Thus, elementary school students with asthma are likely to receive help from staff with insufficient asthma training. Asthma action plans are under-utilized by middle and high schools with 46 percent of school principals reporting usage of asthma action plans for all students with asthma at their schools (SHEP, 2002). On a positive note, 96 percent of middle and high schools report assuring immediate access to asthma medications. Based on these data, improving school management of asthma is another potential point of intervention to improve asthma management in the state.

Although Wisconsin asthma hospitalization and mortality rates are declining, there is opportunity for improvement of asthma management. Better routine care and medication, decreasing exposure to environmental triggers, and improving asthma management in schools are all goals to strive for in Wisconsin. Education and interventions targeted towards improving these measures, with a special emphasis in groups disparately affected by asthma, will be needed to help decrease the continuing burden of asthma in Wisconsin.

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Technical Notes

Report Terminology

Asthma Attack Rate: The proportion of the population with asthma that reports having had at least one asthma attack in a specified period of time.

Confidence Interval: The confidence interval is measure of the precision of an estimate. The wider the interval, the less precise the estimate. The interpretation of the 95% confidence interval is that there is a 95% chance that the true value of the estimate lies within the range of the interval.

Current Asthma Prevalence: The proportion of the population that reports currently having asthma. This is a subset of the population that has ever been diagnosed with asthma. People can be diagnosed with asthma but may no longer have an active form of the disease.

Former Asthma Prevalence: The proportion of the population that has ever been diagnosed with asthma but does not currently have asthma.

Lifetime Asthma Prevalence: The proportion of the population that has ever been diagnosed with asthma.

Prevalence: The proportion of the population at a specific time affected by a disease.

Rate Calculations

- Rates are used throughout this report to measure the burden of asthma. A rate is the number of health events (in this case, asthma-related events) in a given population divided by the number of people in that population who can experience the health event within a specified time (for example, the years 1990-2002)
- In this report, only events occurring among Wisconsin residents were used to calculate rates. Deaths of Wisconsin residents that occur in other states are reported to the Wisconsin Vital Records office and thus, are included in these rate calculations. Hospitalizations and hospital emergency department visits of Wisconsin residents occurring in other states, however, are not reported and therefore, not included in rate calculations. One exception is Medicaid-specific data which does include services provided by out-of-state providers. All events that occurred in Wisconsin to non-Wisconsin residents were excluded in rate calculations.
- Bridged-race census estimates available from the National Center for Health Statistics (http: //www.cdc.gov/nchs/about/major/dvs/popbridge/popbridge.htm) were used to estimate the annual Wisconsin population for the years 1990 to 2002. These census estimates are from July 1st of each calendar year. These population estimates were used as the denominator when calculating asthma hospitalization, hospital emergency department visit and mortality rates.
- A crude rate is the number of events that occur in a group divided by the population of that particular group. Unless otherwise noted, in this report, rates presented for specific age groups are crude rates. When rates for all ages combined are presented, rates are age-adjusted to account for any differences in the age distribution between populations. Directly

age-adjusted rates were calculated by applying the age-specific rates in the population of interest in Wisconsin to the US 2000 April 1st census standard population. Age-adjusted rates should be viewed as relative indexes rather than exact rates. Additional information on age-adjustment is available at: http://www.cdc.gov/nchs/datawh/nchsdefs/ageadjustment.htm#HP#20).

- In this report, the age categories used to present most age-specific rates (0-4, 5-14, 15-34, 35-64 and 65 and older) were chosen to allow for comparisons with national asthma surveillance data reported by Mannino et al, 2002. Overall rates were directly age-adjusted using these age groupings.
- Rates based on a small number of events can be variable. For example, if 5 deaths occur in a population of one million in a year and 10 deaths occur the next year, the rate changes by 100% from one year to the next. If, instead, 500 deaths occurred in a population of one million in a year and 505 deaths occur the next year, the rate changes by only 1% even though the difference in the number of deaths (5) is the same. As illustrated, changes in rates based upon a small number of events should be interpreted with caution. In this report, where necessary, years of data have been combined to decrease rate variability due to small numbers of asthma events in a given location or time.

Determination of Statistical Significance

- Determination of statistical significance for data in this report is based on non-overlapping 95% confidence intervals. Although this is not strictly speaking a statistical test, it is a commonly accepted way to compare estimates. It has been noted to be more conservative than formal statistical testing (Schenker and Gentleman, 2001).

Acronyms

BHI	Bureau of Health Information, DHFS
BMI	Body Mass Index
BRFS	Behavioral Risk Factor Survey
CDC	United States Centers for Disease Control and Prevention
DHCF	Division of Health Care Financing, DHFS
DHFS	Wisconsin Department of Health and Family Services
FHS	Wisconsin Family Health Survey
HEDIS	Health Plan Employer Data and Information Set
NAEPP	National Asthma Education and Prevention Program
NHLBI	National Heart, Lung, and Blood Institute
SHEP	School Health Education Profile
YRBS	Youth Risk Behavior Survey
YTS	Youth Tobacco Survey

Appendices

Appendix A. Data Sources

Behavioral Risk Factor Survey (BRFS)

The Wisconsin Behavioral Risk Factor Survey (BRFS) is an annual, statewide telephone survey of a sample of Wisconsin household residents aged 18 and older which produces estimates representative of the Wisconsin population living in households. The Wisconsin BRFS is part of the national Behavioral Risk Factor Surveillance Survey (BRFSS), which is coordinated by the U.S. Centers for Disease Control and Prevention. Every state health department conducts a survey as part of the system to measure adult health risk behaviors and attitudes and the use of preventive health services.

The BRFS is the only source of current asthma prevalence data in Wisconsin. Asthma questions have been included on the Wisconsin BRFS since 1999. In 2002, for the first time, two optional asthma modules were included on the Wisconsin BRFS. The adult asthma module contains nine questions (see Appendix F for a copy of these questions) asked of adults with current asthma including information on quality of life and health care utilization. Traditionally, the BRFS only asked questions pertaining to adults aged 18 years and older. In 2002, a child asthma module was included which included questions about asthma in children living in the household with the adult survey respondent. Special survey weights had to be calculated to calculate asthma prevalence in children based on these questions.

In 2002, the Wisconsin BRFS had 4,356 completed phone interviews. Any responses where the respondent answered "Don't Know/Not Sure" and "Refused" were not included in estimating response rates. Only results for subgroups that included at least 100 respondents are reported.

Death Records

Death certificates for deaths occurring in Wisconsin are collected by the Vital Records Office, Bureau of Health Information (Division of Health Care Financing (DHCF), DHFS). The death certificates are submitted by the 72 County Register of Deeds offices and by two city health offices (West Allis and Milwaukee). Deaths of Wisconsin residents that occur in other states and countries are recorded by those governments and submitted to the Wisconsin Vital Records Office.

In 1999, the coding system used to classify causes of death changed to a newer version (from the International Classification of Diseases-9 (ICD-9) to ICD-10). This led to a decline in the number of deaths classified as being due to asthma. Comparability ratios have been calculated to adjust for the coding conversion. The comparability ratio for asthma (0.89) was used to calculate corrected asthma mortality rates from 1999-2001 (Anderson et al., 2001). The corrected rates for these years were used to calculate the average asthma mortality rate from 1990-2001.

Elementary School Asthma Survey

In 2003, the Division of Public Health, Wisconsin Department of Health and Family Services partnered with the American Lung Association of Wisconsin to develop and administer a survey to

better understand asthma education and management in Wisconsin elementary schools. The survey had four main topic areas: asthma education for students and staff, identifying and tracking students with asthma, asthma policies/inhaler law implementation, and school demographics.

Surveys were sent to all public (n=1,212) and private elementary (n=724) school administrators in Wisconsin in June of 2003. A slightly modified version of the survey was sent to elementary school nurses (n=630). A total of 703 surveys were completed and returned reflecting an overall response rate of 27 percent.

Family Health Survey

The Wisconsin Family Health Survey (FHS) has been conducted annually by the Bureau of Health Information, Division of Health Care Financing, DHFS since 1989. It is the only source of historical asthma prevalence data in Wisconsin. The survey collects data on health status, health problems, utilization of health care services, and health insurance coverage among Wisconsin residents.

The FHS is conducted by telephone in a sample representative of the Wisconsin population living in households. About 2,700 households are sampled annually. The survey phone interview is completed by the adult in the household most knowledgeable about the health conditions of household members. This individual answers questions for the entire household, so there may be less accuracy in the responses than if each individual answered the survey for themselves. A special weighting variable is used to calculate prevalence estimates, which takes into account the probability of each individual responding to the survey.

Fight Asthma Milwaukee Allies Surveillance Data

Fight Asthma Milwaukee Allies (FAM-Allies) is a community-based asthma coalition working towards improving the quality of life of children with asthma and their families in Milwaukee. Among the coalition's many activities is conducting surveillance in the Milwaukee area.

In 2002, FAM-Allies administered a cross-sectional survey in grades three to five in two Milwaukee elementary schools where greater than 90 percent of students receive reduced lunches and the neighborhood had more than 3 asthma hospitalizations per 1,000 children. The survey was also administered at two urban Women, Infants and Children (WIC) clinic sites to parents of children aged 12-47 months to identify children with possible asthma. Caregivers of children with possible asthma and school-aged children with possible asthma received a follow-up survey to assess quality of life. A pediatric-specific survey was given to the children.

The first survey was returned by 169 of 250 (68 percent) eligible WIC clinic clients. Of eligible parents of elementary school children, 290 of 583 (50 percent) completed and returned the survey. Sixty-five caregivers of WIC children, 83 parents of school-aged children with asthma, and 79 school-aged children filled out and returned the quality of life surveys. The data collected via these surveys characterize the experience with asthma of the most urban area of Wisconsin.

Appendices

Appendix A. Data Sources

Hospital Emergency Department Visits

In 2002, the Bureau of Health Information (DHCF, DHFS) began collecting data on emergency department (ED) visits from Wisconsin hospitals. Information on race and ethnicity was not reported. ZIP code information collected was used by BHI to determine county of residence. If a ZIP code straddled county boundaries, the patients from that ZIP code area were randomly allocated to a county based on a probability equal to the proportion of the ZIP code area's population in each county.

Of asthma hospital ED visits, 571 (2.5 percent) were for patients who reported ZIP codes that were out of state. These ED visits, as well as those with a missing or invalid ZIP code (n=7), were not included in rates for this report. All asthma hospital ED visit rates presented in this report are for Wisconsin residents only. Out-of-state hospital ED visits of Wisconsin residents are not captured in these data. It is important to note that these rates are based on the number of asthma hospital ED visits (principal diagnosis (ICD-9-CM codes 493.00 - 493.92) and not the number of people with asthma hospital ED visits.

Inpatient Hospitalizations

Inpatient hospitalization data have been available in Wisconsin since 1989 from the DHFS Bureau of Health Information. Data are reported by all of Wisconsin's acute care, non-federal hospitals. Data presented here are from the years 1990 to 2002, the most recent year of complete data available. Information on race and ethnicity was not reported consistently until 1991, thus sub-group analyses do not include 1990 data.

ZIP code information collected was used by BHI to determine county of residence. If a ZIP code straddled county boundaries, the patients from that ZIP code area were randomly allocated to a county based on a probability equal to the proportion of the ZIP code area's population in each county.

It is important to note that rates are based on the number of hospitalizations and not the number of individuals admitted to hospitals with asthma as the principal diagnosis (ICD-9-CM codes 493.00 - 493.92). A total of 2,158 hospitalizations or 2.5 percent of all asthma hospitalizations were for non-Wisconsin residents as determined by patient ZIP code data from 1990-2002. All asthma hospitalization rates presented in this report are for Wisconsin residents only. Out-of-state hospitalizations of Wisconsin residents are not captured in these data.

Medicaid

The Wisconsin Medicaid program is a state/federal assistance program, administered by the Wisconsin Department of Health and Family Services, which provides medical insurance to individuals who meet specific eligibility criteria. These eligibility criteria are a combination of income level and other factors such as falling into a specific age category, having a disability or being pregnant. As of September 2003, there were approximately 750,000 individuals covered by the Wisconsin Medicaid program (Wisconsin Medicaid web site, accessed October 2003).

As the Medicaid program pays for health care of recipients, detailed information on procedures, ambulatory visits, hospitalizations and prescription medication usage is maintained by the program for the purpose of reimbursement. Data pertaining to asthma health care usage among Medicaid recipients was utilized in this report for the years 2000 through 2002.

National Health Interview Survey

The National Health Interview Survey (NHIS) is a multi-purpose health survey conducted by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC), and is the principal source of information on the health of the civilian, non-institutionalized, household population of the United States. The NHIS has been conducted continuously since 1957.

NHIS data are collected through a personal household interview by Census interviewers. From each family in the NHIS, one sample adult and one sample child (if any children under age 18 are present) are randomly selected, and information on each is collected with the Sample Adult Core and the Sample Child Core questionnaires. Nationwide estimates of lifetime asthma prevalence have been available from the NHIS since 1997. Current asthma prevalence has been available since 2001.

School Health Education Profile

The School Health Education Profile (SHEP) in Wisconsin is conducted by the Wisconsin Department of Public Instruction and is used to monitor characteristics and assess trends in health education and policies in public middle/junior high and high schools. The survey is developed and supported by the CDC Division of School and Adolescent Health Program.

The first Wisconsin SHEP survey was conducted in 1994 and administration was repeated in 1998 and 2002. All regular public secondary schools serving at least one of grades 6 though 12 are included in the school sampling frame. The survey has two sets of questionnaires - one for the school principal and the other for the lead health teacher from each school included in the sample. Asthma policy questions were first included on the 2002 survey on the school principal survey. In 2002, 361 out of the 459 (79 percent) principal questionnaires and 352 out 459 (77 percent) lead health teacher questionnaires were returned. Results reported here are from the 2002 SHEP school principal survey.

Worker's Compensation Data

The Department of Workforce Development (DWD) administers the Worker's Compensation program in Wisconsin. The department maintains a database of all claims for worker's compensation that includes a text format variable on the injury or disease for which a claim is being filed. The DWD provided a subset of this data set to the Division of Public Health, which was selected, based upon respiratory system involvement and asthma as the key word mentioned in the text injury/disease variable. Two occupational disease experts in the Division of Public Health coded all selected cases into nine different categories including probable asthma and possible asthma. Any disagreement among the coders was resolved by discussion or a third clinical opinion. In this report, data from 1998 to 2002 are presented.

Appendices

Appendix A. Data Sources

Youth Risk Behavior Survey

The Youth Risk Behavior Survey (YRBS) is part of a national surveillance system led by the Centers for Disease Control and Prevention. The survey is conducted in several states and large cities across the United States to monitor health-risk behaviors of public high school students in grades nine through twelve. In Wisconsin, the survey has been administered every two years since 1993 by the Wisconsin Department of Public Instruction.

In 2003, public schools in Wisconsin containing grades 9, 10, 11, and 12 were included in the sampling frame. Sixty-five schools were selected systematically with probability proportional to enrollment. The survey was completed by 2,121 students in 50 public high schools. The school response rate was 77 percent and the student response rate was 87 percent leading to an overall response rate of 67 percent.

Youth Tobacco Survey

The Wisconsin Youth Tobacco Survey (YTS) is a comprehensive measure of youth awareness, attitudes and related behaviors about tobacco use in Wisconsin. The purpose of this survey is to monitor trends of these attitudes and behaviors to assist in improving youth programs and initiatives. It is a nationwide survey coordinated by the Centers for Disease Control and Prevention that was first administered in Wisconsin in the academic year 1999-2000. In Wisconsin, the survey is coordinated by the Bureau of Chronic Disease Prevention and Health Promotion in the Wisconsin Department of Health and Family Services. In Wisconsin, the survey has been continued on an annual basis in public middle school youth and biennially in public high school youth. The 2003 YTS, for the first time, included two asthma-related questions.

In 2003, public schools containing the grades 6, 7, and 8 were included in the potential survey sample. A random sample was chosen from all eligible public schools in the state. All students in the selected classes were eligible to participate in the survey. The survey is administered during the spring semester of each academic year. Forty-six of 50 (92 percent) randomly selected middle schools agreed to participate. In the participating schools, 1,864 of the 2,140 sampled students (87 percent) completed usable questionnaires resulting in an overall response rate of 80 percent.

Appendix B. Detailed Data Tables

Table 17. Current Asthma Prevalence among Wisconsin Adults, BRFS, 1999-2002.

	Current Asthma Prevalence			
	1999-2000*		2001-2002	
	Percent	95 % CI	Percent	95 % CI
Sex				
Male	5.7	(4.5-6.8)	6.8	(5.8-7.9)
Female	9.2	(6.6-7.9)	9.4	(8.3-10.4)
Age (years)				
18-34	8.3	(6.6-9.9)	9.8	(8.1-11.4)
35-64	7.3	(6.1-8.6)	7.6	(6.6-8.5)
65+	6.7	(5.0-8.5)	7.2	(5.6-8.7)
Race / Ethnicity**				
Non-Hispanic White	7.4	(6.5-8.3)	7.8	(7.0-8.5)
Non-Hispanic African American	10.6	(6.6-14.5)	15.3	(10.8-19.9)
Non-Hispanic Native American	8.3	(0.2-16.5)	13.0	(4.3-21.7)
Other	8.3	(2.8-13.7)	5.7	(2.0-9.5)
Hispanic**	9.0	(2.7-15.3)	8.7	(4.6-12.9)
Wisconsin Adults Overall	**7.5**	**(6.6-8.4)**	**8.1**	**(7.4-8.9)**

* The asthma questions on the 1999 and 2000 BRFS were worded slightly differently ("Did a doctor ever tell you that you have asthma?"), so estimates from these years are not directly comparable with estimates from 2001 and 2002.

** The Hispanic category includes individuals who identified themselves as Hispanic regardless of race.

Data Source: 1999-2002 Wisconsin Behavioral Risk Factor Surveillance System, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Appendices

Appendix B. Detailed Data Tables

Table 18. Annual Number of Asthma Hospitalizations among Wisconsin Residents, 1990-2002.*

	Year													
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Age Group (Years)														
≤4	1,537	1,379	1,547	1,457	1,142	1,205	1,295	1,308	1,143	1,109	1,079	980	949	16,130
5-14	1,195	1,336	1,244	1,369	1,018	1,039	1,095	1,368	968	955	1,019	734	665	14,005
15-34	1,123	1,112	1,206	1,440	1,283	1,397	1,263	1,185	1,041	1,006	913	837	736	14,542
35-64	1,493	1,591	1,459	1,684	1,588	1,668	1,809	1,622	1,674	1,938	1,744	1,921	1,872	22,063
≥ 65	1,260	1,201	988	1,165	995	914	874	795	861	906	913	951	959	12,782
Sex														
Female	3,593	3,627	3,478	3,915	3,449	3,579	3,639	3,562	3,456	3,487	3,346	3,250	3,120	45,501
Male	3,015	2,992	2,966	3,200	2,577	2,644	2,697	2,716	2,231	2,427	2,322	2,173	2,061	34,021
Race														
White	-	4,418	4,310	4,924	4,011	4,168	4,133	4,089	3,632	3,804	3,594	3,596	3,434	46,113
African American	-	1,425	1,634	1,659	1,567	1,589	1,763	1,703	1,554	1,530	1,491	1,321	1,352	18,588
Native American	-	40	58	54	65	60	56	51	44	48	50	68	68	662
Asian	-	40	51	50	52	64	54	58	42	52	59	44	53	619
Ethnicity														
Hispanic	-	-	194	234	210	232	226	211	201	232	122	138	163	2,163
Non Hispanic	-	-	5,922	6,703	5,606	5,840	5,941	5,793	5,289	5,192	5,097	4,912	4,828	61,123
Total	**6,608**	**6,619**	**6,444**	**7,115**	**6,026**	**6,223**	**6,336**	**6,278**	**5,687**	**5,914**	**5,668**	**5,423**	**5,181**	**79,522**

*Asthma listed as the principal diagnosis (ICD-9-CM codes 493.00 - 493.92)

Data Source: 1990-2002 Inpatient Hospital Discharge Data, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Table 19. Annual Number of Asthma Deaths among Wisconsin Residents, 1990-2001.*

	Year												
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
Age Group (Years)													
≤4	2	0	0	0	2	0	1	0	0	3	0	0	8
5-14	3	1	3	3	1	4	4	1	2	2	2	3	29
15-34	9	9	3	4	5	8	12	6	6	5	9	5	81
35-64	27	24	16	27	24	36	37	17	22	25	23	20	298
≥ 65	65	69	56	66	83	51	71	70	63	50	54	38	736
Sex													
Female	70	57	48	59	73	55	67	60	55	53	55	46	698
Male	36	46	30	41	42	44	58	34	38	32	33	20	454
Race*													
White	92	98	70	88	99	84	102	82	83	70	68	58	994
African American	14	4	8	11	12	13	23	10	9	13	20	7	144
Other	0	1	0	1	4	2	0	2	1	2	0	1	14
Total	**106**	**103**	**78**	**100**	**115**	**99**	**125**	**94**	**93**	**85**	**88**	**66**	**1,152**

*Asthma listed as the underlying cause of death (ICD-9 codes 493.0 - 493.9 and ICD-10 codes J45 and J46)

Data Source: 1990-2001 Vital Records Office, Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Appendices

Appendix C. Table of County-Specific Data

Hospital ED visit, hospitalization and mortality rates by county are summarized in Table 20. Ranks for each county are presented with a lower rank signifying a higher rate in that county. For example, Milwaukee had the highest hospitalization rate by county from 2000-2002 and thus was assigned a hospitalization county rank of one.

Table 20. Hospital Emergency Department Visit, Hospitalization and Mortality Rates and County Ranks, Wisconsin Counties, 1990-2002.

County	ED Visit Rate (per 10,000) 2002	ED Visit County Rank	Hospitalization Rate (per 10,000) 2000-2002	Hospitalization County Rank	Mortality Rate (per million) 1990-2001	Mortality County Rank
Adam	41.4	13	10.5	10	2.6§	68
Ashland	48.0	6	10.0	13	3.4§	66
Barron	18.3	59	8.7	23	19.6	22
Bayfield	34.8	27	10.3	11	12.2§	51
Brown	40.0	16	8.8	22	18.1	29
Buffalo	9.7*	70	3.6*	69	42.2	1
Burnett	38.7	19	7.6	31	29.6	4
Calumet	25.7	45	5.3	59	29.0	5
Chippewa	36.1	24	13.3	3	19.4	24
Clark	58.8	3	11.9	6	20.3	20
Columbia	12.5	69	6.5	47	23.7	12
Crawford	21.1	56	4.9	63	23.8	11
Dane	23.7	50	8.1	27	17.9	31
Dodge	37.9	22	7.3	34	11.8	54
Door	17.7	61	5.4	57	12.7	50
Douglas	18.0	60	2.6	72	16.4	37
Dunn	26.5	41	6.7	45	15.3	41
Eau Claire	31.6	34	7.0	37	20.5	19
Florence	4.8*	72	2.6*	71	0.0	70
Fond Du Lac	27.8	40	6.0	51	18.8	28
Forest	17.6*	62	11.9	7	5.3§	64
Grant	25.4	47	4.5	68	20.9	16
Green	33.4	31	9.3	16	26.1	8
Green Lake	34.3	29	4.6	65	7.1§	62
Iowa	28.5	39	5.6	56	27.9	7
Iron	12.6*	68	3.2*	70	0.0	71
Jackson	40.4	15	6.9	39	22.7	15
Jefferson	33.6	30	7.1	36	12.9	49
Juneau	36.6	23	7.7	30	15.3	42
Kenosha	48.2	5	13.3	4	14.5	45
Kewaunee	17.2	64	5.2	61	16.7	34
La Crosse	23.6	52	5.3	60	18.0	30
Lafayette	30.3	36	4.6	66	3.8§	65

Langlade	35.5	26	4.6	67	15.9	39
Lincoln	44.7	10	9.9	14	10.2§	57
Manitowoc	32.0	32	9.1	18	10.6	55
Marathon	16.9	66	6.9	41	6.3	63
Marinette	28.6	38	8.1	28	13.2	46
Marquette	43.9	11	9.0	19	23.9	10
Menominee	84.0	2	16.2	2	0.0	72
Milwaukee	97.0	1	21.0	1	20.5	18
Monroe	38.1	21	7.0	38	25.5	9
Oconto	34.5	28	7.2	35	9.8	58
Oneida	22.0	55	10.2	12	12.0	52
Outagamie	24.6	48	5.3	58	20.6	17
Ozaukee	20.6	58	4.8	64	15.1	43
Pepin	13.7*	67	6.0*	52	19.1§	26
Pierce	8.5	71	7.5	32	13.2	47
Polk	26.5	42	9.0	20	20.2	21
Portage	38.9	18	6.0	54	8.5	61
Price	31.3	35	6.1	49	3.1§	67
Racine	56.5	4	12.5	5	17.1	32
Richland	46.9	7	8.9	21	35.3	3
Rock	42.2	12	9.6	15	22.8	14
Rusk	39.0	17	7.9	29	15.5§	40
Sauk	45.5	8	6.1	50	16.0	38
Sawyer	38.5	20	8.3	25	17.0§	33
Shawano	31.9	33	6.7	44	28.0	6
Sheboygan	22.7	53	11.8	8	19.1	27
St. Croix	17.4	63	9.2	17	19.4	23
Taylor	25.5	46	6.6	46	9.7§	59
Trempealeau	21.0	57	6.3	48	37.0	2
Vernon	26.1	43	6.9	40	16.5	35
Vilas	40.8	14	8.5	24	2.1§	69
Walworth	24.4	49	6.8	42	14.6	44
Washburn	26.0	44	11.7	9	19.2	25
Washington	17.0	65	5.7	55	10.4	56
Waukesha	23.7	51	7.4	33	11.8	53
Waupaca	36.1	25	6.0	53	23.0	13
Waushara	45.1	9	6.8	43	16.4	36
Winnebago	29.6	37	5.0	62	13.0	48
Wood	22.6	54	8.3	26	8.5	60
Wisconsin Overall	**42.0**		**10.1**		**18.5**	

* Rates are based on less than 20 visits and should be interpreted with caution.

§ Rates are based on less than 5 deaths and should be interpreted with caution.

Data Source: Bureau of Health Information, Division of Health Care Financing, Wisconsin Department of Health and Family Services

Appendices

Appendix D. Wisconsin DHFS Division of Public Health Regions

Figure 45. Map of DHFS Public Health Regions in Wisconsin.

Appendix E. Population Distribution of Wisconsin

According the 2000 US Census, the Wisconsin population as of April 1st of 2000 was 5,363,675 persons. Although white persons continue to make up the majority of Wisconsin's population, there has been a large increase in the proportion of the population represented by other racial and ethnic groups. Wisconsin's total population of non-whites increased from 7.8 percent to 11.1 percent from 1990 to 2000. The fastest growing ethnic group in Wisconsin was the Hispanic or Latino population, which increased by 107 percent in this period (University of Wisconsin Extension and Applied Population Laboratory, 2001). African Americans continue to be the second largest racial group in Wisconsin representing 5.7 percent of the population. The population distribution of the United States is included in Table 21 for comparison to the Wisconsin population distribution.

Table 21. Wisconsin and US Census Data by Sex, Age Group, Race and Ethnicity, 2000.

	Population	Wisconsin Population Distribution (%)	US Population Distribution (%)
Male	2,649,041	49.4	49.1
Female	2,714,634	50.6	50.9
Under 5 years of age	342,340	6.4	6.8
5 to 9 years	379,484	7.1	7.3
10 to 14 years	403,074	7.5	7.3
15 to 19 years	407,195	7.6	7.2
20 to 24 years	357,292	6.7	6.7
25 to 34 years	706,168	13.2	14.2
35 to 44 years	875,522	16.3	16.0
45 to 54 years	732,306	13.7	13.4
55 to 59 years	252,742	4.7	4.8
60 to 64 years	204,999	3.8	3.8
65 to 74 years	355,307	6.6	6.5
75 to 84 years	251,621	4.7	4.4
85 years and over	95,625	1.8	1.5
One race	5,296,780	98.8	97.6
White	4,769,857	88.9	75.1
Black or African American	304,460	5.7	12.3
American Indian and Alaska Native	47,228	0.9	0.9
Asian	88,763	1.7	3.6
Native Hawaiian and Other Pacific Islander	1,630	*	0.1
Some other race	84,842	1.6	5.5
Two or more races	66,895	1.2	2.4
Hispanic or Latino (of any race)	192,921	3.6	12.5
Overall Wisconsin Population.	**5,363,675**	**100.0**	

*Represents zero or rounds to zero.

Data Source: U.S. Census Bureau, Census 2000

Appendices

Appendix F. Behavioral Risk Factor Survey Adult Asthma Module: Questions asked of Adults with Current Asthma

During the past 12 months, have you had an episode of asthma or an asthma attack?

a. Yes

b. No

c. Don't know/Not sure

d. Refused

During the past 12 months, how many times did you visit an emergency room or urgent care center because of your asthma?

a. Number of visits __

b. None

c. Don't know/Not sure

d. Refused

During the past 12 months, how many times did you see a doctor, nurse or other health professional for urgent treatment of worsening asthma symptoms?

a. Number of visits __

b. None

c. Don't know/Not sure

d. Refused

During the past 12 months, how many times did you see a doctor, nurse or other health professional for a routine checkup for your asthma?

a. Number of visits __

b. None

c. Don't know/Not sure

d. Refused

During the past 12 months, how many days were you unable to work or carry out your usual activities because of your asthma?

a. Number of days

b. None

c. Don't know/Not sure

d. Refused

Symptoms of asthma include cough, wheezing, shortness of breath, chest tightness and phlegm production when you don't have a cold or respiratory infection.
During the past 30 days, how often did you have any symptoms of asthma?

a. Not at any time
b. Less than once a week
c. Once or twice a week
d. More than 2 times a week, but not every day
e. Every day, but not all the time
f. Every day, all the time
g. Don't know/Not sure
h. Refused

During the past 30 days, how many days did symptoms of asthma make it difficult for you to stay asleep?

a. None
b. One or two
c. Three to four
d. Five
e. Six to ten
f. More than ten
g. Don't know/Not sure
h. Refused

During the past 30 days how often did you take asthma medication that was prescribed or given to you by doctor? This includes using an inhaler.

a. Didn't take any
b. Less than once a week
c. Once or twice a week
d. More than 2 times a week, but not every day
e. Once every day
f. 2 or more times every day
g. Don't know/Not sure
h. Refused

Appendices

Appendix G. Useful Asthma Links and Resources

Asthma Management

http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm

http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5206a1.htm

http://www.cdc.gov/nccdphp/dash/00_pdf/asthma.pdf

http://www.wisconsinmedicalsociety.org/health_topics/general_detail.cfm?id=74

Data and Surveillance

http://www.cdc.gov/nceh/airpollution/asthma/asthmadata.htm

http://www.wisconsinmedicalsociety.org/uploads/wmj/fiore.pdf

Asthma Initiatives in Wisconsin

http://www.chawisconsin.org/

http://www.chw.org/display/PPF/DocID/5086/router.asp

http://www.lungusa.org/wisconsin/

http://www.famallies.org

Acknowledgements

Wisconsin Department of Health and Family Services

Authors:

Livia Navon, MS, RD, Epidemiologist, Bureau of Environmental Health, Division of Public Health

Beth Fiore, MS, Epidemiologist and Principal Investigator, CDC Asthma Capacity Building Grant, Bureau of Environmental Health, Division of Public Health

CDC Asthma Capacity Building Grant:

Henry Anderson, MD, Co-Principal Investigator and Chief Medical Officer, Bureaus of Environmental and Occupational Health, Division of Public Health

Lawrence Hanrahan, PhD, Co-Principal Investigator, Bureau of Environmental Health, Division of Public Health

Meredith Lins, RN, BSN, Occupational Nurse, Bureau of Occupational Health, Division of Public Health

Terry Moen, MS, JD, Co-Principal Investigator and Director, Bureau of Occupational Health, Division of Public Health

Eden Schafer, MPH, Asthma Program Manager, Bureau of Environmental Health, Division of Public Health

Additional DHFS Contributors:

KM Monirul Islam, MD, MPH, Occupational Epidemiologist, Bureau of Occupational Health, Division of Public Health

Joe Olson, Data Manager, Bureau of Environmental Health, Division of Public Health

Karl Pearson, MS, Research Analyst, Bureau of Health Information, Division of Health Care Financing

Tom Sieger, MS, CIH, Director, Bureau of Environmental Health, Division of Public Health

Judy Witt, MS, Family Health Survey Manager, Bureau of Health Information, Division of Health Care Financing

Centers for Disease Control and Prevention:

Sheri Disler, Public Health Advisor, National Asthma Control Program

Jeanne Moorman, MS, Statistician, National Asthma Control Program

Acknowledgements

Additional Contributors:

Lori Allerson, BA, APS Healthcare

Kristine Dawson, MS, APS Healthcare

Erik Goetz, BS, APS Healthcare

Katrina Kramer, MHSA, APS Healthcare

Janet McMahon, MPH, American Lung Association of Wisconsin

John Meurer, MD, MBA, Fight Asthma Milwaukee Allies (led by Children's Hospital and Health System), and Medical College of Wisconsin

Jeremy Otte, BS, American Lung Association of Wisconsin

Brian Weaver, Wisconsin Department of Public Instruction

Reviewed by:

Reviewed by members of the Wisconsin Asthma Coalition Surveillance and Evaluation Work Group and the following members of the Wisconsin Asthma Coalition Executive Committee:

Linda Caldart-Olson, MS, RN, Department of Public Instruction

Dona Wininsky, MA, American Lung Association of Wisconsin

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Wisconsin Department of Health and Family Services

Division of Public Health
Bureau of Environmental Health

P.O. Box 2659
Madison, WI 53701-2659
http://dhfs.wisconsin.gov

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